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OF

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JOURNAL

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Department of Agriculture

OF

WESTERN AUSTRALIA.

Vol. XIII. JANUARY 20, 1906. Part 1.

EDITOR'S NOTES.

MILCH GOATS.—The Department of Agriculture, U.S. of America, has just imported 63 Maltese milch goats, for the purpose of establishing the manufacture of Roquefort, Camebert, and other Swiss cheeses.

THE JOURNAL.—It has been decided that the free distribution of the *Journal* shall be discontinued and a fee of five shillings per annum charged, which amount will cover the cost of postage. Those, therefore, who wish to receive the *Journal* after the present issue will please forward their application, together with a money order or postal note for five shillings, the amount of the subscription.

CHANGE OF SEED.—Farmers cannot be too persistently urged upon to change their seed occasionally. Results of experiments lately conducted in England has shown that when seed obtained from other districts is used it has given as much as from 50 per cent. to 75 per cent. increase in the crop yield. If any of our farmers are anxious to exchange seed, they should make their wishes known as early as possible. A paragraph will be inserted in the *Journal* on receipt of particulars.

CROP RETURNS.—The following crop estimates for the current season have been received: Swan district, 5,046 acres, 59,983 bushels, average $10\frac{1}{2}$ bushels per acre; Perth district, 50 acres, 450 bushels, average 9 bushels per acre; Fremantle district, 10 acres, 100 bushels, average 10 bushels per acre. The Hay crop, which is fairly good in the Swan, Perth, and Fremantle districts, is estimated to yield 3,464, 237, and 128 tons respectively.

SALT LICK.—A good and simple salt lick for cattle is made by adding 6lb. of slacked lime to 112lb. of common salt; the mass is then pressed and stored; pieces are cut off and placed where the stock can have ready access to it. It is wonderful how soon they find it out, and how greedily they go for it. It is nature's own preventive for a lot of ills, and no stock owner should allow his horses or cattle to want for a good salt lick.

BUTTER MADE IN ONE MINUTE.—A machine for making butter in one minute has just been put on the London market by S. Howes, of 64 Mark Lane, London. It is a practical invention; by its aid butter can be made in one minute's turning from either sour or sweet cream. The produce is of an excellent grade. For private families and small dairymen it should be invaluable. It is made in seven sizes, ranging from one quart to 13 gallons. One big feature is the cheapness of the machine and few working parts.

CO-OPERATIVE FARMING.—England at the present time stands unrivalled in the successful establishment of co-operative societies amongst farmers and those getting their living from the land. A recent official report states that there are at present 113 branch societies, embracing 33 counties, the membership of which has increased 50 per cent. during the last 12 months, and now numbers over 7,000. Freights are cheapened, more produce sold, and better returns realised. Besides this, in the purchasing of machinery great saving is made.

HUMUS.—The successful farmer keeps his ground well supplied with humus. Humus not only contains a large amount of fertilising material, but it assists in warming the soil in the winter, and retains the moisture in the summer. No better plan exists than an occasional crop of cow pea ploughed into the ground. This is one of the best crops for green manuring, and will repay the farmer every time, adding, as it does, nitrogen as well as humus to the soil; making loose sandy soils more compact, and clayey soils more open and porous.

TESTING SOIL FOR LIME.—To ascertain whether a soil is deficient in lime, take a fair representative sample of the soil, dry and crush it. Then put a couple of ounces into a tumbler with a little water, so that it forms a thin paste. To this add two ounces of hydrochloric acid, which can be bought cheaply at any chemist's. If the mixture effervesces quickly, it is an indication that lime is not deficient. If there is scarcely any effervesce, the soil may be characterised as poor in lime. This is a rough test, but it is a fair guide. The actual percentage of lime can only be determined by an agricultural chemist.

MOHAIR.—Those who have gone into the business of breeding Angora goats will be glad to learn that the price of mohair is steadily rising. The mohair business has grown firmly in the past twenty years, with a gradual increase of consumption and a steadily improved method of manufacture, and diversity of fabrics made. It is subject to great fluctuations in value,

being, perhaps, more influenced by the decrees of fashion than other fibres, because of its comparatively limited supply. The world's product is usually consumed in the manufacture of plushes, braids, and ladies' goods, for which it is available when the price is moderate; but when fashion sets in for some special class of goods for women's wear, the increased demand frequently pushes up the price 50 to 60 per cent. above the normal value. The latest fad in its use is in the manufacture of women's felt hats, and it is safe to say hundreds of thousands of pounds of mohair and mohair noil are used to supply the demand for this article alone.

CARE OF FOALS.—Some owners occasionally neglect their young horses which do not compare favourably in their looks with their companions, and thereby often make a very great mistake, as it is remarkable how some of the uglier ones develop at times. Every practical breeder will admit this fact; and therefore it is a grave error on the part of those who grudge the plain yearlings an extra allowance of corn, and devote all their energies to the advancement of the handsomer ones. Naturally the latter are the most likely to repay the care bestowed upon them, but if no chance is allowed the others they cannot be expected to improve, as they frequently will, if given a proper chance. No young horse can thrive upon poor land as he will upon a rich one, and at this time of the year, when nature demands a stimulant, the efficacy of an extra feed or two is great. A horse that is worth keeping is worth doing well; and this is a fact that owners may lay to heart to their advantage.

STUMPS.—It has always been a mystery why a man would rather plough, harrow, reap and "cuss" around a field full of stumps and stones than make an effort to get them out of his way. I know one farmer who is a model in many things in connection with his farm work and management, and yet who allows stumps to remain in his field from year to year until he has done enough work lifting his plough around the stump to have dug it up, if all the work had been done at the same time. They not only occupy ground that ought to be producing crops, but are a real hindrance to cultivation and harvesting, causing an ever-recurring loss as each succeeding crop is planted and gathered. It costs money or labour to remove these stumps and stones, but no money can be better spent, or labour more profitably employed. It not only pays, which is, of course, the main thing, but it gives a man more self-respect, not to say anything about the respect of others.

BROAD TIRES.—It is surprising how backward the farmers are in this State in the matter of the use of broad tires on their carts. Broad tires perform the duty of rollers in keeping a smooth compact roadway free from ruts. Narrow tires tear up and break a good road; wide ones consolidate and repair bad roads and keep good roads in proper condition. For orchard work, collecting fruit, carrying manure, etc., no cart can be used with such advantages as a broad-tired one. Mr. Harper, of Woodbridge nurseries, has had one in use for some years in his orchard, and it has more than paid for itself. In testing the value of the wide *v.* narrow-tired wheel, two ordinary farm wagons were used, one having 6-inch and the other $1\frac{1}{2}$-inch

tires, both wagons in all other respects being the same in build and weight; each was loaded with 2,000lb.; the power used for the narrow tire, with its 2,000lb., on a gravel road, pulled 2,472lb. on the wide-tired wagon. On a deep mud road the wide-tired wagon was pulled with 3,200lb. with greater ease than the narrow tire with 2,000lb. In concluding the experiments under all possible conditions, the difference in draught was in the favour of the broad tire, and ranged from 17 to 120 per cent.

GRASSES AT PINJARRA.—The Chief Inspector under the Insect Pests Act, in a report to the Director of Agriculture, says:—"I visited Mr. E. M. Fisher's orchard in the hills, situated 16 miles from Pinjarrah. The orchard consists of about seven to eight acres of first-class fruit-trees, in addition to which there are about 350 acres of really good land which is bearing a heavy crop of native grasses, more particularly in those places where the timber has been ringbarked. In cleared bush patches the seeds have been sown of Kentucky bluegrass, Bokhara clover, and tall fescue. Although planted late in the spring and eaten down by sheep, the plants are doing well. Other grasses, such as the African Wonder, Rhodes grass, and *Paspalum dilatatum*, have all been sown, and are doing well. The trees are the largest jarrahs I have seen, and the soil is admirably suited for orchards and grazing."

WINE INDUSTRY.—From the latest English returns dealing with the wine importations for the nine months ending 30th September show a most satisfactory increase in the imports of Australian wines over the corresponding nine months of last year. The increases in this period are:—

Australia	146,922 gallons
Spain	69,337 gallons
S. Africa	12,075 gallons
Madeira	1,589 gallons

The increase from South Africa appears large, but the total imports for the nine months are only 14,782 gallons. I have been unable to discover the reason of these sudden large shipments. The decreases in the nine months over the same period of 1904 are:—

Germany	78,436 gallons
Netherlands	42,413 gallons
France	10,980 gallons
Portugal	35,339 gallons
Italy	38,511 gallons

France is holding her own more satisfactorily this year than last, for in the nine months of 1904, as compared with the same period of 1903, the decrease in French imports was 1,048,826 gallons.

BARLEY THRESHING:—Numerous complaints have appeared of late in the various agricultural papers on the injury done to barley in threshing. The want of care causes the breaking of the grain. Complaints are frequently made by brewers and maltsters of the injury done to barley in the process of threshing, owing to the fact that the drum of the threshing machine is set so close that many of the grains are chipped or broken. The

presence of these injured grains greatly deteriorates the value of the barley for malting purposes, as the broken, bruised, or skinned grains fail to germinate, and soon show signs of mould, thus leading to unsoundness in the malt and bad results in the brewery. The injury caused by over-dressing is not limited to those grains which are cut in halves; grains closely nipped at one or both ends, or such as have been bruised and peeled, are equally objectionable. In fact, if by too vigorous threshing the husk of the barley is damaged, although the damage may not be apparent, irregularities in the malting, accompanied by the production of mould, are likely to result. When farmers commence a day's threshing, therefore, they should at the outset, and repeatedly during the day, carefully examine the grain. If any signs of injury are observed, the drum of the machine should be slightly opened. It is better that part of the beard should be left adhering to the grain than that any risk should be run of injuring the reputation and value of home-grown barley through having broken and chipped grains.

ESTIMATING SILO CONTENTS.—Many wish to build a silo, but do not know what size they need, or hardly how to find the capacity. It is an easy matter if you know the combination, and we take the following simple formula from the *Rural New Yorker*. To find the capacity of a square silo we multiply the length, width, and height of the silo in feet and divide the result by 50 to get the tonnage, as an average cubic foot of silage weighs 40 pounds, thus requiring 50 cubic feet for a ton. For a circular silo we square the diameter and multiply by ·7854 to get the surface measurement, and this by the height. Suppose we wish to build a silo 30 feet high and 16 feet in diameter: $16 \times 16 = 256 \times {\cdot}7854 = 201{\cdot}06 \times 30 = 6031{\cdot}8 \div 50 = 120$, the tonnage capacity of the silo. The size one needs will of course depend upon the number of animals kept, the length of time they are to be fed, and the amount to be fed daily to each animal. How much to feed must depend upon circumstances. If we were in sections where land is easily tilled and suitable for corn we should feed what they would eat up clean twice a day, and a light feeding of hay once a day. This method of feeding permits a large amount of stock to be kept upon a small acreage, as the soil, by large additions of fertility in the shape of manure, grows richer every year. On many farms this allows the selling of hay, and still keeps up the fertility of the farm; 40 pounds fed daily will require $3\frac{1}{2}$ tons per cow for six months', or five tons for eight months' feeding. Where land is hard to till it is often more profitable to feed silage only once a day and hay twice; 20 pounds daily will require about two tons per cow for six months', or $2\frac{1}{2}$ tons for eight months' feeding.

THE "CRAVINGS" OF HOGS.—Every stockman that has kept pigs in confinement has observed their strange craving for seemingly unnatural substances—sand rock, soft brick, mortar, rotten wood, charcoal, soft coal, ashes, soap-suds, and many other articles greedily devoured when offered. Such articles lie outside the range of nutritive substances, and we are puzzled to know why they should be so eagerly consumed. In the wild state the hog ranges through the woods and open tracts, living upon small animals, larvæ, and vegetation generally. This material is of such character and is gathered in such a manner that some of the soil is swallowed with it. With rings in its nose to prevent rooting while in the pasture, confined on

board floors during the fattening period, and given feeds containing little ash, the pig's life is passed under unnatural conditions. Another cause for this craving may be the intestinal worms, which are checked or destroyed by some of the substances consumed. Unsatisfactory or incomplete as such explanations may be, the fact remains that the pig seeks out these unnatural substances and greedily consumes them. Ashes, either from wood or coal, will always be in place in the feeding pen, and even in the feed lot. It is surprising how much of these will be consumed by a bunch of pigs. Feeding trials show that pigs, when confined to an exclusive corn diet, are greatly benefited by ashes, this substance causing the feed to be more effective and adding to the strength of the bones; the latter result being due, probably, to the lime in the ashes. Bone meal is another substance useful for strengthening the bones of pigs. By saving the droppings, substantially all the value of this high-grade fertiliser may be secured for field and garden after it has served its purpose with the pigs.

Codlin Moth Parasites.—In the last issue of the *Journal* mention was made of the successful introduction of the parasite on the codlin moth grub into California. In a copy of the *California Fruitgrower*, since received, the following interesting note appears:—"Speaking of the recent work of Mr. George Compere, the West Australian Government entomologist, says that the enthusiastic predictions about *Ephialtes carbonarus*, the new parasite for the codlin moth which was brought to California from Spain last winter by this entomologist, seem in a fair way to be fulfilled, and in a shorter time than was expected. It was hardly thought that any results could be looked for this year, as the parasite would require some time to adapt itself to new conditions and environment and to multiply in sufficient numbers to produce any decided impression on the immense numbers of codlin moths at work in the orchards throughout the State. But the insect seems to have made itself perfectly at home from the start, and in some sections has already so greatly increased in numbers as to have improved in a decided measure the quality of the apple crop so far as wormy apples are concerned. In a letter to John Isaac, secretary to the Horticultural Commissioner, E. K. Carnes, horticultural inspector at the offices of the deputy commissioner, in this city, who with Mr. Ehrhorn has had charge of the work of propagating and distributing the parasites, says concerning them:—'Yesterday we went over to Novato, to the property of the Novato Land Company, in response to a statement that the *Ephialtes* were there in hundreds. The place has 11,500 acres in it the old De Long apple orchard, and I was very much surprised and more than pleased to find the parasite flying about in large numbers. Found them on my hands, caught them in my net, and had the pleasure of having the foreman tell me that this is the first season in many years that the orchard was nearly so free from worms. They claim that there is over 30 per cent. improvement over past years. The fruit looked well, and there are very few wormy apples. This is certainly very encouraging, and as I saw it myself I know that it is so.'"

PASTURE LANDS.

WHEREIN OUR WEALTH LIES.

CAN THEY BE MAINTAINED?

By C. F. Chaplin, the Director of Agriculture.

I.

It would not be in the fitness of things to persuade the agriculturists of this State into an attempt to lay down large areas of pasture calculated to be permanent, and thus possibly bring about disastrous financial results, until we are "thoroughly sure of our ground." That a large portion of the arable land of Western Australia has a soil suited to the production of fodder grasses, both exotic and indigenous, is no doubt true, but before a comprehensive scheme for securing a stability in these grasses—a stability which shall enable us to raise stock of the highest value—we must "question Nature," so to speak, by means of experiment. This is, of course, the duty of the State, and towards this end the efforts of the Department of Agriculture shall, *inter alia*, in future be directed. It is in the power of the State to give an example to the whole of the tillers of the soil, and the expense of such example when borne by the many becomes infinitesimal to the individual. By trials and failures success will assuredly be met. Then, profiting by the results of our experiments, we can announce a crusade against the inadequate native growths, and provide a substitute with the more valuable grasses. It must be understood, however, that there are also a number of indigenous grasses in the State capable of being improved, no doubt, into valuable fodders by systematic cultivation.

The question of permanent and nutritious pastures of the highest value has been for many years occupying the attention of the principal civilised countries. Mr. M. J. Sutton, one of the leading authorities in Great Britain, in his admirable work on "Permanent and Temporary Pastures," says that "the very diminished capital in the hands of many farmers renders it impossible for them to till their land efficiently, and I am persuaded that the only way of insuring justice being done to their holdings is by laying down a considerable portion of the land to grass."

Again in Canada those in charge of the Department of Agriculture are heard saying that they are bound to produce cheaper and in greater quantity. It is not the area that is troubling them so much, but the quantity each acre will produce per annum, and in this there is a true gauge of national and individual well-being. Towards this end, it is argued with much logic and force, permanent pastures will have a great deal to say. The Professor of the Agricultural College at Ontario said that as a stimulus to healthy appreciation of the importance of permanent pasture, and as one of the best possible ways to impress the people of Canada, he would ask why it was "that Great Britain, with all her age, experience, and wealth of other things, had already placed half her arable area under grass? It is not altogether

because of outside competition in other crops, nor of climatic trouble, but because she knows of no better way to conserve, to wait, and to make money by doing little at the least risk and outlay. Britain has never hesitated how to 'hedge' in her agriculture when troubles arose, and to-day her farmers make more revenue per acre per annum on the best pasture than from any other source."

The time has now arrived when the farmers of this State must turn their attention to a system of mixed farming. They cannot "hedge" when they are dependent upon the one crop, say, of cereals. When a farmer is unfortunate and loses his cereal or hay crop, his time and capital have been practically wasted for one year. In mixed farming there are a number of collateral products which bring in a fairly sure return, and by a proper rotation in raising these products, together with the stock for consuming them, a maximum of fertility is maintained in the soil.

It may be urged that most agriculturists are convinced of the great value of permanent pastures, and that what they want to know is how to produce them. This may be true, but too much emphasis cannot be laid on certain subsidiary phases of a question which must play the most important part in the future rural husbandry of this State. It is for this reason that attention is directed to the pecuniary gain in having a certain area of the farm under pasture. An authority shows that "beef and mutton can be more cheaply fattened, and milk more cheaply produced, on a farm of which one-half or two-thirds is in grass than on arable land alone." It may not be possible to fatten so many animals per acre, as when stall-fed on arable produce; but the point now under consideration is farming at a profit, and one of the most potent factors in the increase of pastures will be this facility for producing meat and milk with advantage to the grazier as well as the consumer.

How to Create Pastures.

The variation of soils and climate in the several localities of the State suitable for the growth of exotic grasses demands different treatment so as to coincide with the respective conditions. As before pointed out, experiments are necessary before any detailed methods for the stability of pastures can be laid down; but some farmers can, in the light of experience already gained, do much in their several districts with further experimental plots.

Hitherto, the experimenting by farmers, with the exception of a few, has been of a most unsatisfactory character, and owing to their lack of enthusiasm and slipshod methods of cultivation, characteristic of their ordinary farm work, the seed and fertilisers supplied by the Department were simply wasted. In some cases the stock were turned on the plots before the grass had attained anything like a stronghold, while others seemingly forgot that they had experimental grass plots in the field, and therefore ploughed them out when cultivating for the next season's crop of wheat.

To those, however, who are desirous of trying to produce pastures, and who are imbued with that spirit of conquest which has so often found access to Nature's mysteries, it is permissible here to lay down a few rules which must be adhered to before anything like success can be expected. Attempts have been made to get exotic grasses (or those generally known as English grasses) to grow in certain parts of the State, among the timber or indigenous vegetation, without previous cultivation. While grasses of this

kind have been grown in loose volcanic soil after a dense undergrowth has been burnt off and the larger trees killed, to attempt to make a pasture on most of the areas of soil containing more or less acidity, without cultivation, lining, or fertilising, is simply a fruitless attempt to coerce Nature.

Experiments made at the State farms so far, and by some of the progressive farmers, notably Mr. Crosby in the Broomehill district, give evidence that under a proper system of cultivation it is possible to secure a permanent pasture. Apart from the English grasses, African Wonder grass, Rhodes grass, and Eragrostes Pilsoa seem to defy the dry times, growing in sandy soil with great vigour. Certainly in these we have grasses that, while being of good feeding quality, will be of immense value eventually to the State. The quantity of seed or roots of these grasses is at present limited in this State, but an effort is being made to obtain a further supply from abroad, and to conserve as much seed as possible from that now produced here, for extending the areas next season.

The cultural preparations for grass land is, in the main, the most important, as it is upon this being properly done that the future usefulness of the pasture depends. Experience at the Hamel experimental farm shows the necessity for having the land drained. The grass sown on narrow lands, well crowned and rounded down to the finishing furrows, speaks for itself in its vigour when compared with that on flat or badly-ploughed lands. There is, indeed, a very marked difference, which should, in fact, be noted by farmers engaged in producing any kind of crop.

The important point to be urged here can be further exemplified by quoting the remarks of an eminent English authority. He says that, "in future, no undrained land shall be laid down to grass; otherwise careful tillage, costly manures, and the finest grass seed will certainly be wasted. The result is merely a question of time. Sooner or later the valuable grasses which are sown will be supplanted by sedge and rush and other semi-aquatic vegation, until the pasture gradually reaches the worthless condition which invariably prevails on undrained land."

It is a very mistaken notion which seems to prevail among many farmers that when a soil remains wet in winter, and is consequently undrained, the better chance the crop has to withstand subsequent dry weather. That such an idea is erroneous, a look into a few of the facts will show. Investigations have clearly revealed that every year more water passes through land naturally or artificially drained than through soil generally saturated with moisture; and, in giving his experience of this, the author of "Permanent and Temporary Pastures" says that, "where stagnant water lies no rain can enter. It simply runs off the surface by any outlet it can find. The soil can neither breathe nor digest any fertiliser applied to it, and it is incapable of utilising the sun's heat for the development of plant life."

"When rain falls on a well-drained field, it does more than merely moisten the soil and supply plants with water. It has been computed that in each year by means of rain alone every acre of well-drained land is benefited to the extent of ten pounds of nitrogen. Indeed, one of the advantages of good drainage is that it allows the atmosphere to be freely carried into the soil by rain, when the oxygen sweetens and converts injurious organic substances into wholesome food for plants. At the same time, carbonic acid gas, derived from rain and air, performs the same operation for the mineral constituents of the soil." In fact it does not require any great

power of observation to verify this. The failure of the crops altogether in the low-lying, undrained portions of many fields in the wheat-growing districts this season and the good crops on the well-drained slopes, tells its own story.

A Guide to the Understanding.

While the purport of these articles at the present juncture is to be considered more as "suggestive than encyclopedic," it may be expedient, however, to give a few guiding principles with a view of giving agriculturists a better understanding of the methods of laying down pastures, and thus lead them on in a train of thought towards a successful achievement in a branch of husbandry which must revolutionise our agricultural industry.

In recent years scientific research and experiment have gone far in an invasion of what had hitherto been considered Nature's impregnable fortress, and one among others who deserves recognition in this regard is Mr. Robert H. Elliot, of Clifton Park, Roxburghshire, Scotland. Mr. Elliot has put into practice what science has dictated, with the result that he has completely changed the whole aspect of the grazing industry, while he has at the same time demonstrated that such methods increases and maintains the fertility of the soil.

The writer recently received from Mr. Elliot a handy little volume describing fully his methods and successes; and although the principles expounded are the logical outcome of scientific revelation long since made known, his zeal and industry in giving practical effect to them are worthy of every commendation.

It would be beyond the scope of the present article to deal with all the details of Mr. Elliot's scheme, but in a subsequent article the subject shall be renewed. It is to be hoped that our farmers will mark what is being here said; and as the season for operations is now close at hand, that they will prepare a few acres as an experiment in the direction indicated, with a view of getting the system of rotation into accord with the climatic and soil conditions which obtain here. They can then work collaterally, in a manner of speaking, with the State farms, and thus lend a helping hand in the solution of the pasture problem.

Mr. Elliot draws attention to the necessity of producing stock at the lowest possible cost, and this, of course, involves, he says, the production of their food at the lowest possible cost. Both these facts must obviously govern the farming policy of the future. How then can the farmer, he queries, most cheaply provide food for stock? This, again, depends, of course, as to the way manure can be most cheaply supplied. The cheapest and best form of manure is a good turf, for the decaying sod not only supplies the plants with food, but, what is nearly as important, and some might say of even greater importance, provides a good nest, or, in other words, good physical condition of the soil.

It is, therefore, essential that this turf shall be supplied, and this can only be done effectively within a moderate period of time by growing a mixture of large-rooting and deep-rooting plants, managing them well after they have grown, and giving them four to six years' time to form into a turf. When the farmer again ploughs up the land he will start his rotation with the same advantages which the farmers had when they enclosed and ploughed up old pasture lands. He will be so enabled to produce good crops at the smallest expense, and without the aid of any manure, excepting

some artificials with his root crops, such as turnips, mangolds, or rape, and eventually without any when the land has become sufficiently charged with humus.

It is recommended that this process be continued only for four years, when the grass is ploughed out and a root crop, followed by a cereal crop, taken. A root crop should then again be taken, and the land laid down again the following year to grass, the grass being sown with a light cereal crop and the process of forming a good turf recommenced. Every time that this course is repeated the land will become richer and the soil more deeply and thoroughly disintegrated by the roots of the plants, and, therefore, more able to yield better and more certain crops less liable to the attacks of disease.

The formation of the turf in this manner will also cheapen the processes of cultivation in two ways, for it is hardly necessary to say that land deeply and thoroughly permeated with vegetable matter is much more easily ploughed and worked. Mr. Elliot states that he has found that if the land is thickly sown, when laid down, with a mixture of plants having a large and powerful root system, the couch grasses are extinguished, or nearly so, and the expense of clearing the land when again brought under the plough absolutely abolished.

On the rapid creation, then, of a turf composed of plants calculated to leave the largest amount of vegetable matter in the soil, and of plants well able to resist drought and contribute by their qualities to keep stock in good condition, the future of our farming, so far as the arable portions of our lands is concerned, depends. It is, perhaps, unnecessary to say that the same principle applies to the creation of permanent pasture.

Importance of Cultivation.

Before seeding to grass, the greater portion of the lands comprising the agricultural areas of this State requires to be properly cultivated, due regard being paid to the soil being properly drained. The experiences of Mr. James Hunter, of Chester, England, the well-known seed merchant (recorded in Mr. Elliot's work, "Agricultural Changes, and Laying Down Land to Grass"), are worth noting, with a view of impressing upon farmers the absolute necessity of adhering to what has been demonstrated beyond doubt to be the only reliable method of securing a good stand of grass.

It is stated by Mr. Chester that if the seed is sown on soil with a fine tilth and under perfect conditions as regards moisture and heat, every seed having germinating capacity may be expected to establish itself, if not interfered with by birds or otherwise. If sown on soil not properly pulverised, a small and delicate grass seed falling on the outside of a clod might germinate, but might be scorched and killed by a day or two's hot sunshine and drought, but it could obtain roothold. If the same seed fell in a hollow, and was covered by a clod, it would have no chance of germinating, being too deeply covered. In both these cases the seeds are practically lost, and the outcome of the matter is that, while with a fine tilth and suitable conditions as regards moisture and warmth, a perfect germination from all the seeds sown may be immediately obtained. Sowing on rough land cannot possibly give such good results, as probably one-half of these fine seeds have fallen where they cannot succeed, and an extra allowance of seed should be sown on rough land to compensate for the seeds that will be lost.

Large seeded grasses, such as cocksfoot, meadow, tall fescues, and rye grasses, have naturally greater staying powers than the small-seeded grasses and clovers. It must, however, be a question for the agriculturist to decide whether it will suit him better to prepare his land perfectly and sow less seed, or sow on rougher land and use more seed. In many cases it is impossible to prepare the land perfectly, and there is nothing for it but to do the best one can in this respect, and not stint the seed when the land is rougher than it should be at the time of laying it down.

Wherever practicable the soil should, however, be finely tilled. On low-lying places, where the soil is liable to become water-logged, drainage must be resorted to. As a rule, the ploughing of the land in conformity with the natural lay of the country will provide sufficient surface drainage, especially when the lands are well rounded up. On slopes, where there is natural drainage, this method may be dispensed with to some extent; but, generally, it will repay farmers to observe well this question, and not permit their soil to become water-logged. Having first thoroughly prepared the land by cultivating out as far as possible all weeds calculated to interfere at the outset with the young grass plants, we are ready for seeding.

Methods of Sowing.

As soon as there is any indication of the return of the wet season, preparation should be made for laying down the field intended for pasture. As pointed out in the previous article, it would not be wise for any farmer to experiment on a large scale at the start. It has yet to be discovered whether it is better to sow in the autumn or early spring. The environment in that case must be considered. To those, however, contemplating laying down pastures either in large or small areas, the time has arrived when steps should be taken to order enough seed for the two seasons' requirements.

The best methods and times of sowing have even now not been definitely decided upon by the leading authorities in Europe; and in this regard it is interesting to note the remarks of Mr. Elliot, of Clifton Park, Roxburghshire, Scotland. He complains that they in Great Britain are left to grope in the dark owing to the lethargic attitude of the Government in not establishing State Experimental Farms in the various centres to test the points referred to.

It is manifest that in consequence of the variety of soil and climate, and the varying circumstances and requirements of the farmer, no general rule can be laid down as to which is the best method. The late Arthur Young, probably one of the greatest exponents of the art, in securing pastures in Great Britain, approved of either sowing the seeds alone, or with buckwheat, rape, or wheat, according to the time of year. Mr. Elliot sows, as a nurse crop for the grasses, a light seeding of oats or barley, which he has found to answer well both as regards grass and the requirements of the farm.

After seeding, the land should be carefully rolled; if seeded in autumn, the land should be rolled in the beginning of the winter, and in the early spring following, for, in consequence of this neglect, the plants are liable to be thrown out by frost, and also to suffer from drought in the spring. The rolling should be done with careful regard to the weather and the state of the land, which is very apt to be too wet or too dry. Having the land well rolled enables a shower of rain to be much more effectual than it would otherwise be. When the soil is unrolled and, therefore, loose, the water from a shower would quickly evaporate, and be easily carried away by the wind, whereas the rolled soil would cause a shower to go much further in

supplying the plants with moisture. Rolling would sometimes have the effect of keeping plants alive which would otherwise die. A fine surface soil, when in a loose state, conserves water, by preventing it rising to the surface; while you have only to roll it if you wish to bring moisture to the surface to aid in the germination of the seed, and the support of the young plants, which, from lack of moisture, are apt to be starved to death.

In many cases, farmers have come to the conclusion that there is not a sufficient quantity of plant food in the soil, and that this was the cause of their crops failing. Analysis has revealed, oftentimes, plenty of plant food, if the roots could travel freely through the soil, and thus get at it. Mr. Elliot gives an example of a field which, although under arable cultivation for 45 years, would not grow grass. He has a reason for believing that the hardpan which sometimes exists just below the ploughing depth is often the cause of the failure, partly because the roots of grasses and clovers cannot penetrate it, and partly because it checks the rise of water from the subsoil. The field referred to was laid down twice to permanent pasture, and in the second case with an excellent mixture of seed. This mixture, however, did not contain any of the deep-rooted plants now in use. In both cases the pasture was a failure. The field was again laid down to permanent pasture, and was a complete success.

The reason for this success is due to the fact of deep-rooting plants being sown, especially chicory, a very deep-rooting and drought-resisting fodder plant. The chicory sent its roots straight down into the subsoil, after penetrating the very hard pan which lay below the ploughing depth. We here have evidence that such plants as chicory and burnet should be in every mixture of grasses to be grown on similar soil, as the deep rooters aerate the soil, and permit those with roots of lesser depth to obtain moisture from a greater depth, and the benefit of an improved physical condition of soil.

In addition to the evils arising from hard pans, Mr. Elliot draws attention to the fact that our soils, generally, are not kept sufficiently open owing to the deficiency of humus in the land, and hence the roots cannot readily traverse the soil, which has been often shown to contain enough plant food if it were fully available for the use of the plant. If, then, the plant is not given a soil well opened up and kept going with humus by the agency of deep-rooting grasses, more money must be expended in manure when producing ordinary cereal crops. In other words, as far as the plant is concerned, a small quantity of manure in an open soil is of more practical value than a much larger quantity of manure in a soil of inferior physical condition.

There are three losses entailed by inferior physical conditions of soils—(1) That the plant is less able to contend with adverse seasons; (2) that the expense of manurial application must be greater; and that (3) much of the manure that is applied in excess of the requirements of the plants will be lost by waste or downward percolation, while much of it is liable to enter into insoluble compounds in the soil, as, for instance, phosphates of alumina and iron.

Kinds of Grasses and Quantities of Seed per Acre.

In addition to the grasses enumerated in the previous article as showing marked ability in withstanding dry weather, there are several others which can be obtained likely to be of special service in such a climate as this. One

of the most remarkable of the drought-resistant varieties is that known as chicory (*Chicorium intybus*). This grass is supposed to have been first cultivated by the Italians, and is now indigenous everywhere in Lombardy. It is greedily eaten by all stock, and gives good cream and butter. Mons. Crette, an intelligent French farmer, says of chicory that "it is not hurt by drought. He used 20lbs. of seed for less than English acre. No meadows, natural or artificial, can compare with chicory. Lucerne give only 4½ tons of hay per English acre, while chicory will give 11 tons. The dry fodder is well eaten, but is better given green."

Mr. Elliot quotes Arthur Young regarding chicory as follows:—Arthur Young sowed 10lb. of seed over five acres of barley, on a good strong wet loam, among clover trefoil, rib, and burnet, and found that the chicory was always eaten by sheep, cows, and fattening bullocks as close to the ground as any other plant in the field. It produced, after being sown in drills, nearly 30 tons per acre per annum for four years. He had seen chicory flourishing well on clay, loam, sand, chalk, and peat, and has known it sown upon the very poorest spots of poor farms with such success as to prove beyond doubt the great importance of the plant.

It is obvious, after a careful consideration of the question of pastures for this country, that in every mixture of grasses there must be, to ensure success, a sufficient proportion of deep-rooting grass. These go down into the soil, aerate it deeply, assist in loosening up the subsoil, improving capillary action, and enabling the other grasses of less rooting power to obtain greater supplies of moisture and of plant food. Farmers must note this feature if they are to be successful in obtaining good pastures.

A mixture of grasses and clovers for permanent pastures for poor, dry soils, or in a dry climate subject to drought, is recommended as follows:—

(A) Cocksfoot, 8lb.; (A) Tall Fescue, 3lb.; (A) Tall Oat-grass, 3lb.; Meadow Fescue, 5lb.; Timothy, 2lb.; Italian Rye-grass, 2½lb.; (A) Golden Oat-grass, ½lb.; (A) Hard Fescue, 2lb.; (A) Crested Dogstail, ½lb.; (A) Smooth-stalked Meadow-grass, 1lb.; Yarrow, ¼lb.; Alsike Clover, 1lb.; Late-flowering Red Clover, 2lb.; White Clover, 1½lb.; (A) Burnet, 4lb.; (A) Chicory, 2lb.; (A) Kidney Vetch, 2lb.; (A) Lucerne, 2lb.

This makes a seeding in the aggregate equal to 42¼lb. per acre. The grasses marked (A) have great drought-resisting power, and when properly cultivated for, and thus helped to get a firm hold of the soil, will continue to grow and thrive in very dry weather.

Mr. Elliot, of Clifton Park, pins his faith, after repeated experiments, to the following mixture: Cocksfoot, 14lb.; Tall Fescue, 7lb.; Tall Oat-grass, 7lb.; Rough-stalked Meadow Grass, 1lb.; Late-flowering Red Clover, 2lb.; White Clover, 2lb.; Alsike Clover, 1lb.; Yarrow, 1lb.; Burnet, 8lb.; Kidney Vetch, 3lb.; Chicory, 3lb.

This makes 49lb. per acre, the cost of the seed being, in England, about £2 per acre, while the former mixture would cost about £1 14s. per acre.

Any of these seeds can be obtained through Perth seed merchants, and farmers who contemplate laying down a few acres should put their orders in at once, to enable these seeds to be obtained, if necessary, from abroad.

In our next article we will deal with the subsequent management of pastures, and discuss whether it may be advantageous to sow the grasses alone or with a nurse crop of cereals.

HOME FERTILISERS.

By Percy G. Wicken.

The advantages to be gained from the use of fertilisers are being more forcibly impressed on farmers each season, as they see the extra profits derived by their neighbours who have judiciously fertilised their ground. Consequently the quantity of fertiliser required is increasing each season and the imports increase year by year. Although we cannot hope to do without importing fertilisers in this State, there are many sources from which we can derive a considerable quantity of cheap fertiliser close at hand, and available to settlers, in many parts of the State. Many of the items which I am about to enumerate are only available to settlers in certain localities, or who reside within a reasonable distance of the works where such substances are turned out as by-products, and their value is governed by the easiness with which they can be obtained and the distance which they have to be carted.

A large area of our farming areas are close to the sea coast and in many places here fish or fish offal and seaweed can be obtained in considerable quantities. In the U.S. of America the offal from the fisheries and fish canning works is largely used for a fertiliser, and, in addition to being sold in a fresh state to settlers near at hand, is dried and sold to farmers in other districts in the same form as offal from the slaughter yards.

In addition to the offal, all the small fish below the size used in the works and all fish unsuitable for food are added to the fertiliser heap.

According to the *Fish Trades Gazette*, the quantity of fish condemned in London market during a recent year was 1,520 tons, all of which was turned into fertiliser.

The small fish taken in the nets in the herring industry and which are too small for drying are steamed to extract the oil and then dried and sold at 16 dollars per ton. In cleaning and dressing fish for preserving the decrease in weight is about 15 to 35 per cent., according to the class of fish. The total in the U.S.A. is stated to be 112,500 tons, which has to be disposed of and is now rendered into oil and fertiliser.

An easy way to make a small quantity of fish available as a fertiliser is to store it in a pit in the ground. This can be done by digging a hole about six feet square and six feet deep, according to the quantity of fish scrap to deal with. The ground should be dry, and if the ground is soft the sides should be timbered. Make the bottom firm by packing with a little clay, and on top of this place a layer of ashes about four inches deep; then place a layer of fish, say, six inches thick; then a layer of lime two inches deep, then ashes again, and continue on until the hole is full. Then cover up with earth and boards, and allow it to remain for several months. The fish soon become decomposed and mixes with the ashes, and when the whole heap is turned over an excellent manure is obtained.

In drying codfish for market the bones are taken out, and these, when the glue is extracted, form a good fertiliser, of which it is said the annual output amounts to 3,000 tons and the value is 15 to 20 dollars per ton. A sample of fertiliser made from fresh cods' heads showed an analysis of 20

per cent. of phosphoric acid, 6½ per cent. of nitrogen. Such a fertiliser, taken at our local unit values, would be worth £7 13s. in the Perth market.

Other analysis show 8 per cent. nitrogen and 14·9 per cent. of phosphoric acid; value in Perth would be about £8 per ton. A sample of fish manure sold in Sydney is given as nitrogen 6·10 per cent., phosphoric acid 8·28 per cent.; the value at Perth rates would be £5 12s. These illustrations are sufficient to show the value of fish and fish offal as a fertiliser, and no doubt many of our local fish would prove of equal value.

Seaweed is another valuable substance as a fertiliser to those residing near the coast, and if it can be carted cheaply is a very valuable manure for sandy soil, as it adds a large quantity of humus to the soil at very little cost. In many cases seaweed is thrown up on the beach, and can be obtained in unlimited quantities, but its value is determined by what it costs to cart it to the cultivation paddock. The analysis of seaweed in its fresh state gives nitrogen ·16 per cent., phosphoric acid ·09 per cent., and potash 1·18 per cent.; the value at Perth rates would be 9s. 8d. per ton; but if this seaweed could be stacked or pitted near the sea and allowed to decompose before being carted, its value would be much increased, and the cost of cartage reduced.

In an article published in the *Journal* of the Royal Agricultural Society of England, by the late Sir John Bennett Lawes, Bart., and Sir Joseph Gilbert, entitled "The Valuation of the Manures obtained by the Consumption of Foods," the following table is published giving the value of the manure obtained per ton of food consumed:—

	£	s.	d.
Linseed	1	19	2
Linseed Cake	2	11	11
Decorticated Cotton Cake	3	14	9
Palm Nut Cake	1	6	4
Undecorticated Cotton Cake	2	5	3
Cocoa Nut Cake	1	19	10
Rape Cake	2	16	5
Peas	1	16	5
Beans	2	1	11
Lentils	2	0	8
Tares	2	1	1
Maize	0	16	7
Wheat	0	18	11
Malt	0	17	7
Barley	0	17	2
Oats	0	19	9
Rice Meal	0	18	6
Malt Coombs	2	6	7
Fine Pollard	1	15	2
Coarse Pollard	1	18	1
Bran	1	18	6
Clover Hay	1	7	0
Meadow Hay	0	18	7
Pea Straw	0	12	2
Oat Straw	0	7	5
Wheat Straw	0	6	6
Barley Straw	0	6	5
Bean Straw	0	11	5
Potatoes	0	4	1
Carrots	0	2	9
Parsnips	0	3	6
Mangel Wurzels	0	3	2
Swedes	0	2	11
Yellow Turnips	0	2	6
White Turnips	0	2	7

The above values, although based on English quotations, do not vary much from the Perth values, but whatever variations there may be in unit values it would be the same for all the resultant manures, and the table will therefore act as a guide to the value of the manure obtained from different foods. This table is of course on the supposition that the manure is properly kept under cover, and not left exposed to the weather to deteriorate. It will be readily seen that a large part of the outlay incurred for feed is returned in the value of the resultant manure, and also gives the farmer an idea of the amount of valuable fertiliser he is allowing to go to waste by not taking means to save the droppings from his animals. Take, for instance, bran and pollard, which, taking an average value of £7 per ton as a food, yield a fertiliser worth £1 18s. per ton, which considerably reduces the cost of the food. An animal would not be fed on bran alone, but it would be mixed with a proportion of roughage which would reduce the value of the fertiliser as well as the cost of the feed. By calculating the amount of food consumed per day or week, the value of the manure obtained from any animal may be approximately obtained.

Other substances available as a fertiliser and often wasted are—

Deposit from wool-scouring tanks.—The analysis gives nitrogen ·64 per cent., potash ·72 per cent.; and the value is about 13s. per ton.

Wool waste from shearing sheds contains 8 per cent. of nitrogen, and is worth £5 10s. per ton.

Skutch from lined pelts (tanners' refuse) gives nitrogen 1·8 per cent., phosphoric acid ·89 per cent., potash ·20 per cent.; value, 30s. per ton.

Decomposed hair and lime from tannery contains nitrogen 6·86 per cent.; value, £5 per ton.

Tanyard refuse contains nitrogen 2·24 per cent., phosphoric acid ·67; value, 31s. per ton.

Fowl manure contains 1·47 per cent. of nitrogen, 1·94 per cent. phosphoric acid, and is worth about 27s. per ton if well preserved, but the quality varies considerably.

Nightsoil mixed with lime contains nitrogen ·74 per cent., phosphoric acid ·78 per cent., and is worth about 13s. per ton.

Decayed bark and leaves vary according to the variety of timber from which they are obtained, and generally contain a small percentage of nitrogen and vary in value from 8s. to 10s. per ton.

The ash of timber contains a quantity of potash and a small percentage of phosphoric acid, which varies according to the variety of timber from about 4s. to 25s. per ton.

These few notes are written with the idea of encouraging settlers to use such fertilisers as may be available in country districts, and to enable them to know whether such fertilisers are worth the expense of carting. Nearly all the fertilisers mentioned contain several ingredients of plant food, and are consequently nearer to a complete fertiliser than a fertiliser containing only one ingredient of plant food. They are mostly beneficial to the sandy country, as they contain quantities of humus which is needed in this class of

country; on the other hand, most of them contain the fertilising ingredients in an insoluble form, and are not so quick-acting as the more soluble salts, and therefore require to be sown either with the crop or some time before the crop is sown, so as to enable the soil acids to convert the contents into a form in which the plants can make use of them.

HOME-MADE POULTRY APPLIANCES.

By Frank H. Robertson.

In this issue it is my intention of reproducing illustrations of some of the models used by me at lectures and shows, and it is hoped that the written explanations are sufficiently clear to enable the reader to understand their construction and uses. Should anyone require further information, the models can be inspected at any time in my office, in the Department of Agriculture.

Fig No. 1 shows the interior of the brooder. The part A resting on the ground can be compared to a deal case without a bottom, 3ft. long, $2\frac{1}{2}$ft. wide, 6in. high. In the centre is cut a hole 6in. in diameter, into which is inserted part of a naphtha tin, B, the top edge of same being 5in. above the

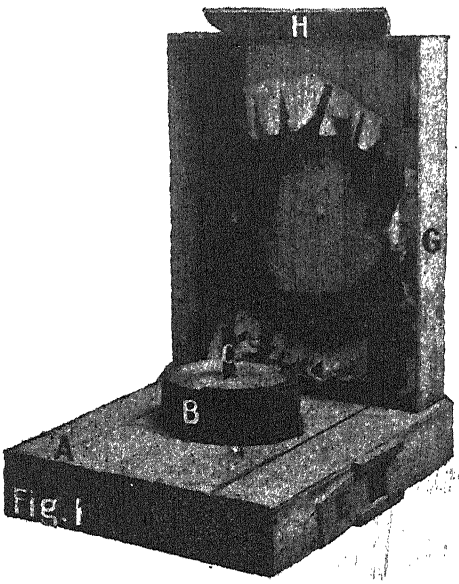


Fig. 1.—Home-made Brooder.

floor of the brooder. The tin is made secure by cutting and turning the edges and tacking same as shown in illustration No. 2. A hole is made in the centre of the naphtha tin, into which is soldered a piece of inch bicycle metal tubing, C, 5in. long. The heat is supplied by a small kerosene lamp, D (Fig. 2), resting on the ground, same being reached by a small slide door

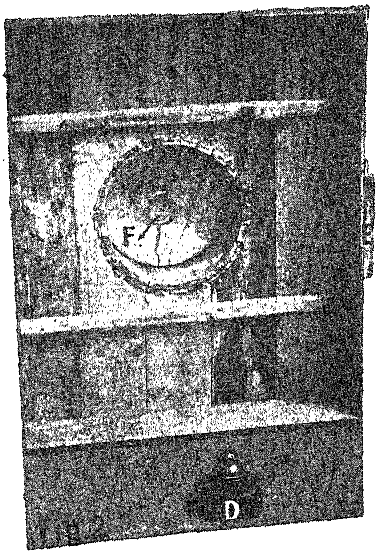


FIG. 2.—HOME-MADE BROODER.

at side E (Fig. 3); but to prevent a too rapid escape of heat, a small radiator F (Fig. 2) 3in. in circumference is suspended over the lamp; it is kept in position by a wire rod which runs down the funnel and hangs on to a bar across the funnel. G (Fig. No. 1) is the cover to the brooder, which is made the same size as the part marked A; an inch hole is bored in the centre to

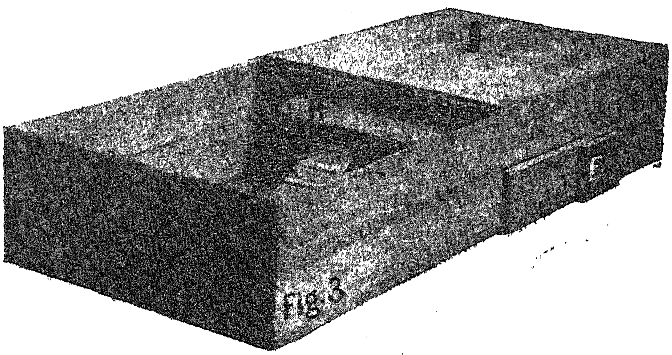
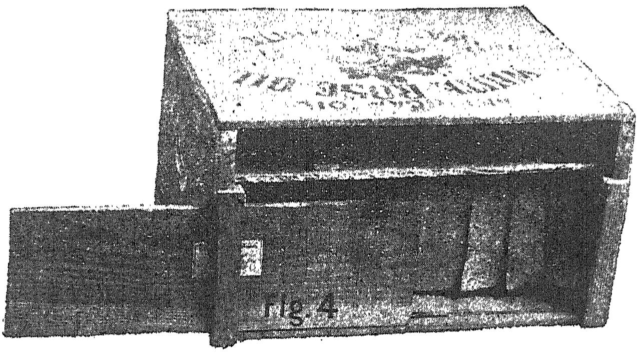


FIG. 3.—HOME-MADE BROODER.

let the funnel through, flannel is tacked on as per illustration, a door, marked H, is cut out of the end and hinged on. Illustration No. 3 shows the brooder

complete, with movable run attached, and ladder into the run. The door can be kept open by means of a string running through the wire netting and fastened on top. The floor on which the chickens rest should be covered with bagging, kept well sanded and cleaned at least once every day.

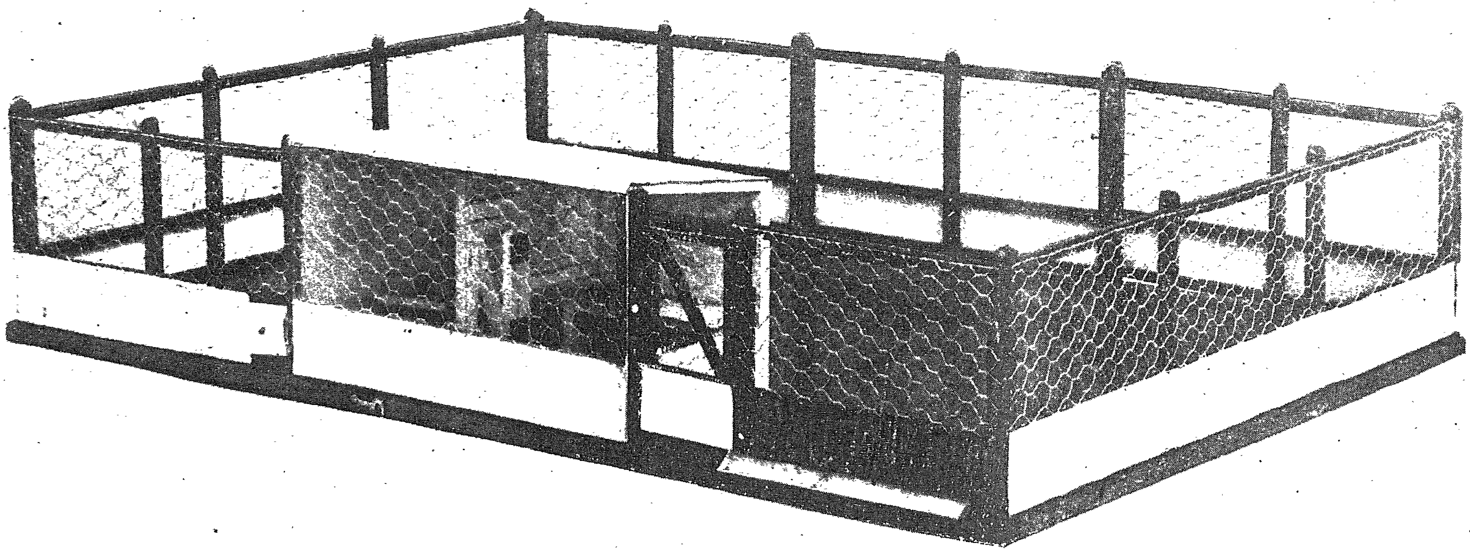


Brooder made from Kerosene Case.

Illustration No. 4 shows a very simple form of a brooder made from an empty kerosene case. Get 10 to 12 strips of flannel 18 inches long and 6 inches wide, tack them in rows on to two separate pieces of deal board taken from another kerosene case, tear the flannel in strips 3 inches wide; a thin strip of wood is nailed on inside the case at each end, 3 inches from the top, to allow the slides to rest on; a strip of half an inch is cut out of the back wall at the top to allow a current of air over the slides, so that the heat in the brooder may be reduced if required, which can be managed by drawing the two slides apart. A sliding door to the front completes the brooder and retains the heat. As a rule, no artificial heat is required; but should the weather be exceptionally cold, it may be found necessary at night time to increase the temperature, which can be done by placing a hot-water bottle in the brooder, well covered with flannel.

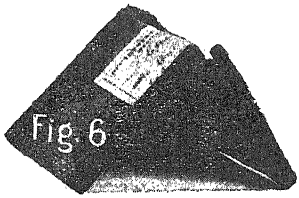
Fowl-house and Run.

No. 5 illustration shows a fowl-house and run complete, the chief feature of which is showing the advantage of having the fowl-house on the front boundary of the run, thus being easy of access and convenience in feeding and watering, both being done without the attendant having to enter the run; the soft food is placed in the trough marked A, the fowls eating through slatted bars. The building is made in two compartments. The first half (B) is kept heavily littered with straw or chaff, into which the hard feed is thrown; the next compartment (C) is the fowl-house, at the side of which is a small trap-door, inside of which stands the water fountain; the nesting boxes stand on an iron shelf in the scratching shed. This fowl-house has an easterly aspect, being wire-netted facing the north and east, and iron to south and west. The illustration shows a top rail; this is not advisable, as it offers inducements to fowls to fly over the boundaries. Iron to the height of two feet all round the bottom is a great advantage, but



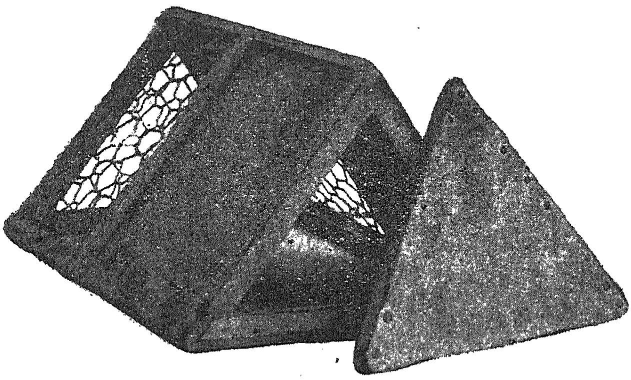
The Ideal Poultry House and Run.

if found too expensive, inch mesh wire-netting may be used for the first two feet and a wider and cheaper mesh above.



A Portable Coop.

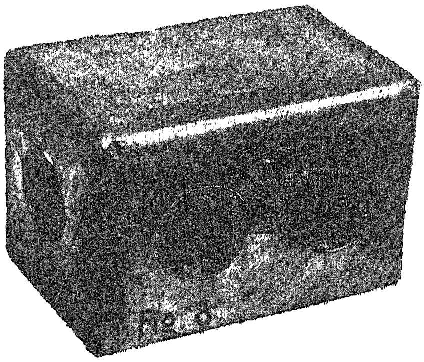
No. 6 model is of a chicken coop or small fowl-house, made as follows:—Take a sheet of plain iron 6ft. x 3ft., place same flat on the ground, and nail on a batten the whole length at each side; saw each batten in half, fold up iron to desired angle, nail on back, using plain iron for preference if to be used as enclosed coop, tack on wire netting in front, or fit in triangular shaped wire-netted frame. This coop will be found very serviceable for the hen with chickens, being easily moved about. If not enclosed in front it makes a good night shelter for chickens which have left the hen but are too young to take to the perches.



Movable Fowl-house and Run Combined.

Illustration No. 7 shows a movable fowl-house and run combined, which is very useful for a variety of purposes, such as a breeding pen—both for hen and chickens—for confining fowls running in orchards during the fruit season, for broody hens, or as a fattening pen. A handy size for making this coop to be easily movable is ten feet in length by six wide. Soft wood should be used to secure the necessary lightness, and 5ft. fluted iron, using two sheets for each side. The handiest way of building this coop is to make it in sections; first lay the two 10ft. battens on the ground and nail on the iron, and two end crosspieces, and one in the centre; make the other side in a similar manner; lean the two together tent fashion and nail on bottom ends, making length according to desired width. Fasten the top by using long thin nails, then put on wire netting, stretching same well to get all wire quite tight. Instead of making a door, make the back removable and all in one piece, using plain sheet iron. This coop is best removed by two persons, one at each end, but one man can move it by getting inside and raising it

from the centre, the weight of the structure resting on the shoulders. If a larger run is required, the house and run should be built each separate. A smaller coop can be made by using only one sheet of plain iron as in Model 6. This makes a very handy form of coop and is easily removable. By limewashing the outside of these coops the heat is greatly reduced, and if extra shade is required, a sack or two thrown over the wire-netted part will do. In cold weather the back faces the West or South, and in hot weather the position is reversed.



No. 8 Illustration

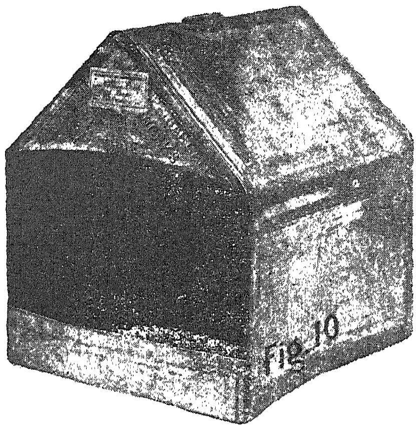
shows a mode of converting a kerosene tin into a drinking vessel for poultry, merely by making round holes as shown in the illustration. A curved pair of snips is the best tool to use for this work. A tin of this sort also makes a suitable receptacle for grit.

To keep kerosene water tins from rusting, a simple and effective plan is to put a few pieces of pitch into the tin, stand same on the oven for a minute or two. The pitch in a liquid state can thus be easily run over the inside floor of the tin, and forms a good clean smooth surface, and prevents rust.

No. 9 Illustration.

This shows the best form of a drinking fountain for chickens. It is made of galvanised iron. The cup and dish are separate. One hole is made in the cup about half an inch from the open edge. The cup is filled with

water. Place the saucer on top, quickly turn both over together, and the water empties into the saucer as required. The day's supply of water is thus provided and the constant re-filling of water tins avoided. An ordinary fruit or jam tin can be used as a cup, but the ordinary china saucer is not deep enough.



No. 10 Illustration—A Nesting Box.

This shows a vermin-proof nest box made from a kerosene tin. The tin is cut down the full length of one of the corners; also round two sides of the top, and then drawn out, thus forming the side walls, to which there is no floor. A square piece of tin is soldered to complete the back, and a strip is soldered to the front. The handle is removed from the end and re-soldered on to the top.

PERMANENT PASTURES.

The following report by Mr. A Despeissis, who was appointed to adjudicate on the entries made under the competition, was furnished to Mr. Theo. R. Lowe, the secretary of the Royal Agricultural Society of Western Australia:—

The permanent pastures competition for the prizes presented by Mr. H. Teesdale Smith, under the auspices of the Royal Agricultural Society of Western Australia, has not this year received the response that it was anticipated the competition would bring.

The conditions of entries for the prizes offered are stated as follows in the schedule of prizes of the Royal Agricultural Society:—

PERMANENT PASTURES.

(Non-irrigated.)

Open to all districts of Western Australia.

Class 1.—For a paddock of not less than three acres in extent, planted since March, 1905, with sown cultivated grasses, salt-bush, or other pasture fodders, showing the best grazing and fattening capabilities:—

1st prize, £10; 2nd, £5; 3rd, £3; 4th, £2, and 5th, £1; presented by Mr. H. Teesdale Smith.

Two competitors only entered, one of whom withdrew at the last moment. The remaining competitor, however, Mr. Hugh Climie of Ballochmyle, Cranbrook, successfully demonstrated with his two entries the practicability of establishing in Western Australia permanent pastures on fields which only a very few years ago were bush land, typical of vast stretches of country along the region served by the Great Southern Railway. I accordingly beg to recommend that Mr. H. Climie be awarded first and second prizes as provided for under the conditions regulating the competition.

The particular locality of Mr. Climie's farm is 60 miles from Albany, on the tableland traversed by the Great Southern Railway. The climate is drier than that of Sydney, which is on the same parallel of latitude as Cranbrook, but it is cooler.

For a number of years the recorded rainfall has been 23 inches, most of which falls between April and November.

The soil is typical of extensive stretches of similar country between Broome Hill and Mt. Barker. The fields were, until a few years ago, under Yate gums, which in general appearance resemble the ironbark of the Eastern States. The soil is a strong, brown loam, fertile and evidently retentive of moisture to a marked degree. It is about two feet deep, and overlies a healthy and permeable yellow clay subsoil which stores up much of the water which the winter rains bring down.

The slightly undulating ground provides good drainage on the surface, and at no time is the land water-logged. Broadly speaking, the features of the land under permanent pastures at Ballochmyle are in every respect similar to a great many thousands of acres of similar land in that particular portion of the State; and what Mr. Climie has achieved any careful farmer can also obtain.

Altogether 34 acres of grasses were sown in small fields ranging from 3 to 14 acres. The ground was brought to a fine tilth by ploughing six inches deep, and by three harrowings followed by rolling to pulverise the clods and consolidate the surface, and by a final light harrowing; that treatment also insured the rising of moisture to close to the surface, and provided a perfect seed-bed which the young roots, after germination, could easily penetrate.

Some of the fields were grazed, and others were mowed. The condition of the cattle and sheep which had been depastured on the grazed land (some dry cows particularly) bore testimony at the time of my visit to the nutritive value of the pasture. All the land under grass had previously been cropped

with cereals, maize, linseed, and other farm crops, and was in good heart, having previously received generous treatment. One striking example of the result of manures in lengthening the period of the growth and the stand of the grass was afforded by one of the fields which was last year under maize, planted in lines, and dressed with 6cwt. of bone superphosphate per acre; there the grasses along the manured rows, even a couple of weeks after mowing, could be seen some distance away standing out clearly in contrast with the rest of the field and looking, as late as the middle of December, both fresh and green.

Out of the several fields sown to grasses designated "artificial grasses" in contradistinction to the native grasses, and also sometimes "English grasses," two were singled out by Mr. Climie at the time the entries were made, early in November last.

Field No. 1.—Four acres sown in August, 1905, with 40lb. of a mixture of grass seed to the acre. Mr. Climie would prefer sowing in April. The mixture of seeds consisted of:—Cocksfoot, Poverty Bay rye grass (perennial), Italian rye grass (biennial), Kentucky blue grass (known as smooth-stalked meadow grass in England, *Poa pratensis*), wallaby grass, rib grass, chewing or hard fescue, timothy, meadow foxtail, a little lucerne, and three kinds of clovers. This block was mowed to prevent seeding, and showed a good sward; stock had been turned on it.

Field No. 2.—Three acres were sown in May, which was also a little late; 2cwt. of bone super. were used the previous season with a crop of linseed. The quantity of seed sown per acre was 20lb., and consisted of:—Canterbury rye grass (perennial), Italian rye grass (biennial), prairie grass, rib grass, and red and crimson clover with a little lucerne added. In November a ton per acre of cured grass hay was obtained from this block.

Absence of Weeds.

Both fields are singularly free from pasture weeds. Clean seeds on clean land is accountable for this. The rib-wort of plantain grass, though not a pasture weed in the accepted sense of the word, is, however, not so valuable as the other grasses, and would be better left out. The same may be said of the Yorkshire fog, which is not relished by stock, and has a tendency to crowd out other better class herbage.

The seeds of Yorkshire fog are often unintentionally introduced with cocksfoot grass seeds, especially in some grades of New Zealand seeds. Mr. Climie got his seeds from English seedsmen of high repute, and while paying a slightly higher price for them, had not to repent buying cheaper and possibly more or less impure seeds.

Yield.

The succesful measure of a crop is gauged by the yield secured from it.

At the time of my visit Mr. Climie had in his barn a stack of new-mown hay measuring 18ft. x 16ft. x 10ft., or 2,880 cubic feet. This was yielded by six acres of the grasses named, and represent, reckoned by the English standard of 1cwt. per cubic yard for new and 2cwt. for old stacked hay, a yield of close on $5\frac{1}{2}$ tons. But for 10 to 12 days since the hay has been sufficiently cured, twelve head of stock—working horses and dairy cows—had received rations of that hay morning and evening; and it is thus seen that it is a moderate estimate to reckon that the six acres yielded at

the rate of one ton to the acre of cured hay. The cost of production of that cured fodder is about £2 per ton, and there is a promise of another equally good yield next season, the cost of which will not, like the first one, be loaded with that of breaking up and preparing the soil and of providing the seeds, but will simply consist of a dressing of a few shillings' worth of manure, then mowing, raking, tossing, and carting away to the barn.

Some Notable Pasture Plots.

Apart from Mr. Climie's permanent pasture fields at Ballochmyle, I had an opportunity whilst travelling through the country west of the Great Southern Railway from Kojonup to the Hay River to notice several promising pasture plots which were not entered for competitions.

At "Slab Hut," on the banks of the Tone river, midway between Kojonup and Cranbrook, and 20 miles from Mr. Climie's farm, Mr. Tunney has alongside his homestead four acres of lucerne and cocksfoot mixed. That field, which was put in a couple of years ago, is also a pronounced success, and supplies an abundance of green fodder for the working horses and the dairy cows. The cocksfoot seed, however, was not as pure as it should have been, and a fair sprinkling of Yorkshire fog can be seen growing with great luxuriance amongst the more nutritious herbage.

So valuable are these four acres of fodder, which equal, or even surpass, any hundred acres of natural pasture on Mr. Tunney's run, that it is the intention to gradually extend the areas under lucerne and grasses.

Some 40 odd miles further south, at Forrest Hill, Mr. Andrew Muir directed my attention to a grass of distinct value which grows there in abundance in his horse paddock. The grass, which is locally called the Marbellup grass, and is known to Botanists as *Eragrostis Brownii*, is a diminutive representative of a family of grasses several members of which grow several feet high. Wherever it grows it holds its own against other grasses, and when other herbage around is browned by the sun of our long dry summers the Marbellup grass, also known in other parts of the world as "love grass," which is a literal translation of its scientific name, grows as green as a leak, and can benoticed at a distance by the light-green patches it forms amongst the drier-looking grasses.

Some ten years ago Mr. C. Brockman showed me along the rich flats on the Mullalyup Brook, a tributary of the Blackwood, a small patch of that grass that had by chance appeared there. That patch was for a time protected against stock, and soon extended. The grass now covers with a thick turf hundreds of acres of the river flats, and sheep as well as horses are always found grazing on it.

At Forrest Hill I had also evidence of the stand it makes even when heavily stocked. Mr. Muir always has in the small paddock contiguous to the stables and yards a few horses, some cattle, and some sheep, and yet the grass thrives and grows in spite of all.

During my round trip in company with Mr. D. Breen of the Agricultural Department, who is well acquainted with the district visited, we had numerous opportunities of noticing the rapidity with which this grass is spreading. It would seem that the horse was the best distributor of this fine herbage, which seeds profusely, the seeds passing through the animal without having their germinating power impaired.

At several of the homesteads in the district we found it flourishing in horse paddocks, alongside the roadways, around watering places, churches, the railway station, and even the country hotels; wherever horses feeding on it have travelled, there they have sown this useful summer grass, one which seems to be rushed alike by all kinds of farm stock. Although sheep, cattle, and horses crop it quite close down to the ground it still retains its vigour, and grows in the dry months of the year when the green grasses are scarce.

Amongst other introduced summer grasses which we either noticed on our tour, or which thrive under the conditions prevailing in the South-West portions of Western Australia, the most widespread is the hardy and useful couch, which Mr. McHenry Clark is successfully spreading in his Kojonup run by using the horse as a distributor, a pinch of seed being placed now and then in the manger with the feed.

At Forrest Hill the Buffalo grass is doing remarkably well on gravelly jarrah country, where it even covers bare rocks and supplies a large amount of feed to stock.

Rib grass grows everywhere, but stock seem only to eat it under protest.

Paspalum dilatatum continues to win praise wherever grown; frosts will not kill it, and it comes out luxuriant and fresh in the summer months. It also stools widely and seeds itself profusely, and is eaten down by stock from the seed heads to the crown.

Rhodes grass (*Chloris virgata*—some say *C. gayana*) promises also to become a strong favourite; it likewise resists frost, and is chiefly valuable as a strong-growing summer fodder.

Natal Red Top (*Tricholoena rosea*) does not stand frost to the same degree, but is a fine, upright, and quick-growing grass. The seeds, which are very light, germinate readily.

Prairie grass and Hungarian forage grass, which both belong to the useful Bromus family, are famous for the stand they make during long dry seasons and for the amount of nourishing fodder they yield.

For moist land, where frosts are not very severe, three panic grasses have been tested in Western Australia and proved luxuriant growers, providing fodder much relished by stock. They are the African Wonder grass, the Guinea grass, and the Barnyard grass.

Sheeps Burnet, chicory, and white Bokhara clover, must not be overlooked in selecting hardy, drought-resisting, and succulent fodder, which, along with some of the others named, will in course of time supplement the useful and hardy indigenous fodder plants of our bush land and increase its stock-carrying capacity.

EXAMINATION OF THE WESTERN AUSTRALIAN POISON PLANTS.

By E. A. Mann, Government Analyst and Chemist to the Department of Agriculture.

SECOND PROGRESS REPORT.

Indigofera Boviperda.

In the *Agricultural Journal* for November, 1905 (page 455), appears a brief account of a plant obtained by the Government Botanist as the probable cause of death of a large number of cattle in the Ashburton district.

It is described by Dr. Morrison in this article as *Tephrosia Rosea*, but in a subsequent communication to me he stated that on further examination he had concluded that it was one of the *Indigofera*, and that he had provisionally named it *I. Boviperda.* This analysis is therefore a temporary digression from the main scheme of the work at present in hand, viz., the analysis of the *Oxylobiums* and *Gastrolobiums.*

Only a small quantity of the plant was collected by Dr. Morrison, and, owing to the period of the year, it will be impossible to obtain a further supply until next season, as it could not be identified with certainty in the dry months. Such quantity as was available, however (about nine ounces), was forwarded to me for examination.

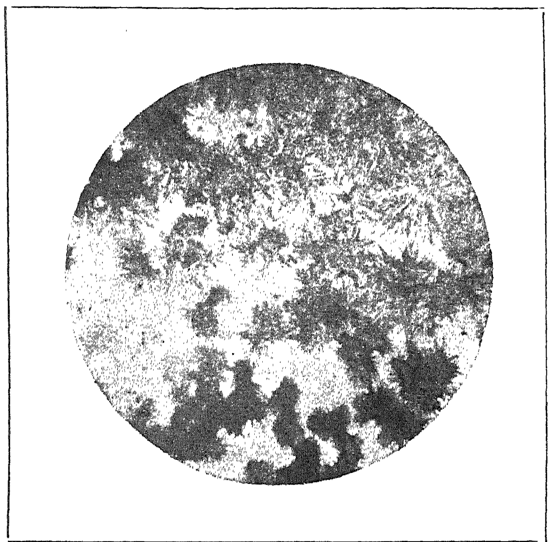
This quantity was, of course, far too small to enable me to make more than a preliminary examination, but the results obtained were so interesting that I hope an effort will be made during the coming season to obtain a good supply on which further investigations may be made.

The sample of the plant, which bore very few leaves and was probably not a very favourable specimen to work on, was reduced to a fine powder and was treated by exactly the same methods as were employed with the York Road plant. (*See* first progress report, this *Journal*, December, 1905.)

The extracts obtained gave distinct indications of the presence of an alkaloid, and this was extracted with all the precautions which had been found necessary in the case of the new alkaloid cygnine discovered in the York Road plant (*Gastrolobium Calycinum*). As a result I obtained a small quantity of white needle-shaped crystals of the hydrochloride of the alkaloid.

The amount obtained was very small, less than one grain being separated in a pure state from the nine ounces of the plant extracted. In order to test the toxicity of this extract a life test was made on the 22nd December, with the following result:—

A solution containing one-tenth grain of the hydrochloride was injected subcutaneously into a guinea-pig weighing 218 grammes. In a few moments the animal was seized with violent spasms and expired in seven minutes. Throughout, the symptoms displayed a marked similarity to those caused by



Crystals of Alkaloid (Hydrochloride) from *Indigofera Boviperda*.

cygnine. The description of the symptoms and *post mortem* appearances given in my first progress report applies exactly to those exhibited in this case. The heart (*in situ*) continued to respond to stimuli for over half-an-hour after death.

The chemical tests, applied as far as was possible with the small amount available, seemed to indicate, however, that the alkaloid, while exhibiting similar symptoms, was not identical in chemical constitution with cygnine, and further work will be necessary, when the additional supplies of the plant are available, to determine its exact character.

A gold salt was prepared from the alkaloid, but it was too small in quantity to obtain satisfactory crystals. A photo. of the hydrochloride of the alkaloid is attached, which can be compared with that published in connection with the York Road poison plant.

Conclusion.—It can be safely concluded, therefore, that the plant contains a poisonous alkaloid having a similar effect to cygnine, and thus another is added to the list of our toxic flora.

ERRATA.

The following corrections should be made in the first progress report of the Government Analyst (examination of the Western Australian Poison Plants), published in the December number of this journal, and the formulæ altered in the key plan published in this number:—

P. 553, l. 5, for "position" *read* "poison."

P. 554, the footnote refers to "Box" poison.

P. 555, the formula for Cygnine should *read* $C_{19} H_{22} O_3 N_2$.

P. 556, the fomula for Cygnic Acid should *read* $C_{10} H_{10} O_4$, and that of Gastrolobic Acid $C_7 H_{10} O_5$.

P. 557 (Test 1), for "minums" *read* "minims."

APRICOTS AND CHERRIES ALONG THE GREAT SOUTHERN RAILWAY.

By A. Despeissis.

On my return from a round trip to the west of the Great Southern Railway, a few weeks back, I had occasion to report to the Director of Agriculture upon the promising prospect for the cultivation of stone fruit in that locality.

Every year, as the trees gain age and receive more careful treatment, the yield improves, this season having proved a good one for that class of fruit.

Cherries have been doing well enough at Mr. Piesse's orchard at Katanning to induce him to add another acre or so of young trees, which are

looking very promising. At the time of my visit the early cherries were being marketed, and the late ones were about ripening. Most kinds did as well as last year, amongst others Early Lyons, Werder's Early, Black Eagle, and Twyford Bigarreau. Bigarreau Napoleon and St. Margaret were also doing well amongst the later kinds, whilst Florence has not commenced bearing yet.

At the Messrs. Beeck's farm, a few miles out of Katanning, some cherry trees about 9 years old, and growing on a sandy slope, once under jam and stinkwood, have developed into large trees, and for several seasons past have brought in a return of £1 a tree to the owners.

At Mr. McHenry Clark's, at Kojonup, and at Mr. Vanzuilicum's, at Eenyellup, some 10 miles to the westward of that place, a good crop had also been gathered; whilst at the Mt. Barker estate some very fine cherries were being picked for the Christmas market.

Apricots have even done better this year along the Great Southern line.

At Katanning nature was doing its own customary thinning at the time of my visit, but the trees, which are of good growth, had as many as they could well carry.

At Eenyellup the result of root-pruning was made very evident on some free-growing Moorpark; those that were root-pruned last year bearing a good crop of fine apricots as compared with others left untouched, which are still growing luxuriantly, but fail to bear.

At the Mt. Barker estate, more particularly, the result of root-pruning is noticeable this season.

One corner of the apricot block there is taken up by 450 apricot trees showing a great range of growth. The varieties are Oullin's Early and Moorpark. They are growing on rich, heavy loam, once under Yate gum, with a few Karri trees here and there.

The clearing of these huge trees necessitated the deep and thorough breaking-up of the ground.

For 10 years the apricots went on spending their energy into luxuriant growth, but no fruit was produced.

Then, two years ago, it was deemed advisable to check their growth and induce them to bear fruit, and root-pruning was applied to them; a liberal dressing of kainit and phosphates being applied at the same time.

Seventeen cases of fruit were picked off the trees a few months after. It was the first crop worth speaking of, and it was very little; but root-pruning could hardly, then, be credited with this improvement, slight as it was.

The following winter, 1905, this block of trees was marked out for further special treatment. The trees were then 11 years old. Some received a dressing of 4lbs. of salt a tree; that salt was broadcasted and dug in.

Some were ringed, a very narrow band only being removed to temporarily check the circulation of the sap.

Others had their straight-growing branches tied down, hoop-fashion, to better distribute the sap pressure through these branches.

Others, again, were left untouched and allowed to grow without restraint, only a few odd branches that were in the way being cut out.

To further stimulate fruitfulness as much as possible, bees were introduced into the orchard, the hives being placed close to the apricot trees.

The net result of this season's crop is an average of over two cases of fine apricots a tree, or over 1,000 cases for the block.

No noticeable difference could be observed in favour of any specially treated lot, all carrying, approximately, the same quantity of fruit.

Root-pruning, associated with a liberal dressing of phosphate and potash fertilisers, would seem to be responsible for this result.

This year the trees have not grown the same rank shoots that they did in previous years; and it would seem as if these 450 apricot trees which Messrs. Johnson and Smith contemplated only last year to grub out and replace with apples have now, after ten years, entered upon a term of profit and fruitfulness.

At that distance from the metropolitan and the goldfields markets, a distance of about 240 miles and 550 miles respectively, marketing of such perishable fruit as apricots and peaches presents no mean difficulties, and the practice at Mt. Barker is to pick and pack the fruit when they first show signs of turning, and when still hard and firm.

As regards peaches, the early variety, Briggs' Red May, seems a favourite in that part of the State, where it bears well, and in that respect behaves better than it does on the western slope of the Darling Ranges, between the hills and the sea, where, although growing into luxuriant trees, it hardly ever sets its fruit on account of the peculiarity it shows of shedding its blossom buds in the early spring.

EXAMINATION OF SOME WESTERN AUSTRALIAN BARKS.

By E. A. Mann, Government Analyst for Western Australia, and R. E. Cowles, Assistant in the Government Laboratory, Perth.

There has of late years arisen a considerable industry in this State through the discovery of the valuable tanning properties of the bark of the so-called "Mallet" Gum, and the following investigation was undertaken to determine whether the barks of any of the other commonly occurring trees of our forest areas were worthy of special attention for tanning purposes.

The Mallet bark has of course received considerable attention from leather chemists,* but the only account which we have been able to find of the examination of other barks from this State is a report by Henry G. Smith, F.C.S. (Assistant Curator, Technological Museum, Sydney, N.S.W.), published in the W.A. Journal of the Department of Agriculture, Vol. XI., Part 4, 1905.

* An exhaustive report by Professor Eitner of Vienna, dealing with the Mallet bark, and published in *Der Gerber*, is not available here at the time of writing.

Through the courtesy of Mr. R. W. Synnot we obtained the following specimens:—

	Ordinary name.	Botanical name.	Mean thickness of bark in millimetres.
1	Ordinary Mallet	Eucalyptus Occidentalis ...	7
2	Salmon Gum	" Salmonophloia ...	15
3	Mannah (or Wattle) ...	Acacia Decurrens	4
4	York Gum	Eucalyptus Loxiphleba	6
5	Morrell	" Longicornis	9
6	White Gum	" Redunca	13
7	Silver Mallet	" Occidentalis * ...	6
8	Black Mallet	" " * ...	8
9	Yate	" Cornula	8
10	Salmon Gum (large) ...	" Salmonophloia ...	10
11	Salmon Gum (small) ...	" " ...	7

* We were unable to find out as to whether these mallets are a distinct species, or only varieties of ordinary mallet.

With the exception of Nos. 1, 6, and 8, none of the barks showed much signs of kino. In Nos. 1 and 8 the gum veins were very prominent.

The barks were sampled by planing off a strip the full length of the sheet. This was then broken and ground to pass a 40-mesh sieve.

The methods of analysis employed were those of the International Association of Leather Trades Chemists, including alterations adopted at the Leeds Conference in 1902,† with the exception that for estimation of non-tannins the chromed hide-powder method of the Association of the Official Agricultural Chemists of America was used.

Kaolin was not used in any filtration, as perfectly clear solutions were obtained without its use. All dryings were done at temperatures of boiling water for eight hours.

The hide-powder was examined and found to contain 12·26 per cent. of nitrogen calculated to 18 per cent. moisture.

Table I. gives the results of the analyses of the samples, and Table II. shows the behaviour of their extracts with various reagents.‡

Moisture.	Amount taken for 1000c.c. of extract.	Total Solids (100c.c. taken).	Correction for filter absorption (100c.c.).	Non-tannins (50c.c.).	Correction for added Moisture.	Totals. Total Solids (100c.c.).	Non-tannins (100c.c.).	Tannins.	Percentage.
%									
(1) 10·45	6 grms.	·3621	·0023	·042	·0067	·3644	·0974	·2670	44·5
(2) 9·43	16 "	·3758	·0092	·049	·0077	·3850	·1134	·2716	16·9
(3) 7·05	20 "	·4299	·0090	·0539	·0145	·4389	·1368	·3021	15·1
(4) 7·11	24 "	·4114	·0058	·0642 *	·0168	·4172	·1620	·2552	10·6
(5) 5·56	24 "	·3705	·0009	·066	·0149	·3714	·1618	·2096	8·73
(6) 10·59	20 "	·3931	·0063	·0638	·0108	·3994	·1492	·2502	12·5
(7) 10·76	8 "	·3772	·0024	·0442	·0073	·3796	·1030	·2766	34·57
(8) 11·77	8 "	·3921	·0021	·0321	·0076	·3942	·0794	·3148	39·3
(9) 3·89	24 "	·3761	·0061	·0568 *	·0128	·3822	·1392	·2430	10·1
(10) 10·15	14 "	·3682	·0014	·0374	·009	·3696	·092	·2776	19·8
(11) 4·56	20 "	·4612	·0080	·0918	·0203	·4692	·2242	·245	12·25

* Solutions not quite decolourised.

† H. R. Proctor. "Principles of Leather Manufacture," 1903, Appendix A., page 475.
‡ Allen, "Comm. Organic Analysis." Third Edition, 1901, Vol. III., Part 1, p. 56.

Reagent.	1.	2.	3.	4.	5.	6.	7.	8.	9.	10.	11.
Beiled with equal vol. dil. H_2SO_4 (1-9)	No precipitate. Cloudy on cooling	No precipitate	No precipitate	Fairly heavy flocculent precipitate	Slight precipitate	No precipitate	Slight precipitate; heavier on cooling	Very slight precipitate; heavier on cooling	Flocculent red-brown precipitate; heavier on cooling	Cloudy appearance	Slight clouding on cooling
Bromine Water	Fairly heavy precipitate	Fairly heavy precipitate	Heavy precipitate	Heavy precipitate	Heavy precipitate	Heavy precipitate	Heavy precipitate	Heavy precipitate	Heavy precipitate	Heavy precipitate	Heavy precipitate
Dilute F_2 Cl_3	Dark green precipitate and colour	Green-brown colour and precipitate	Greenish-brown precipitate	Dark green colour and precipitate	Greenish-brown precipitate	Red-brown coloration	Heavy green-brown precipitate and colour	Slight green-brown precipitate and colour	Dark brown precipitate	Greenish-brown precipitate	Slight green-brown precipitate
On addition of Am.OH	Heavy red-brown precipitate	Heavy red-brown precipitate	Heavy red-brown precipitate	Heavy red-brown precipitate	Heavier precipitate	No precipitate	Change to red-brown	Heavy red-brown precipitate	No alteration	Heavy dark brown precipitate	Very heavy dark brown precipitate
Solution Tartar Emetic	No precipitate	No precipitate	No precipitate	No precipitate	No precipitate	No precipitate	No precipitate	No precipitate	No precipitate	No precipitate	No precipitate
On addition of NH_4Cl.	Cloudy white precipitate	Cloudy ...	White precipitate	Heavy reddish precipitate	Fairly heavy light red precipitate	Only slight clouding	White precipitate	Pale red precipitate	Slight red-brown precipitate	White precipitate	White precipitate
$Cu.SO_4$ ...	Pale green precipitate	Pale green precipitate	Slight light-coloured precipitate	Fairly heavy reddish precipitate	Slight greenish precipitate	Violet colour	Pale precipitate	Slight pale precipitate	Slight yellowish precipitate	Yellow colour	Greenish-yellow colour
NH_4OH ...	Greenish colour, slight precipitate	Blue-black colour and precipitate	Deep violet precipitate	Blue-black colour and precipitate	Blue-black colour and precipitate	No precipitate	Dirty brown precipitate	Greenish-blue colour; slight precipitate	Dark blue colour and precipitate	Dark precipitate with solution; greenish-blue	Dark blue colour; slight precipitate
Lime Water	Slight red-brown precipitate	Slight red-brown precipitate	Purple-coloured precipitate	Fairly heavy red-brown precipitate	Fairly heavy brown precipitate	No precipitate	Fairly heavy red-brown precipitate	Fairly heavy red-brown precipitate	Fairly heavy red-brown precipitate	Light brown precipitate	Brown precipitate
Conc. H_2SO_4 to one drop of infusion	Claret colour at point of contact	Same as 1 ...	Same as 1 ...	Same as 1 ...	Same as 1 ...	Same as 1 ...	Same as 1 ...	Same as 1 ...	Same as 1 ...	Same as 1 ...	Same as 1
Solution of Iron Alum	Dark green colour and cipitate	Dark green colour and precipitate	Very heavy greenish precipitate	Heavy green-black precipitate	Greenish-black precipitate	Golden-brown coloration; no precipitate	Heavy green-black precipitate	Green-black colour; slight precipitate	Greenish coloration; red-brown precipitate	Dark green colour; slight precipitate	Dark green colour; slight precipitate
Amm. Molybdate in HNO_3	Lighter colour; no precipitate	No precipitate	Slight dark red precipitate	Fairly heavy red precipitate	Slight cloudiness	No precipitate	Heavy light brown precipitate	No precipitate	Light brown precipitate	No precipitate	No precipitate

Sample No. 6 has a peculiar character; though it apparently acts upon the hide-powder in the ordinary way, it does not react with iron salts like an ordinary tannin, and presumably true tannins are absent from this bark.

It would appear from the above reactions that the tannins all belong to the catechol rather than the pyrogallol class.*

As regards the colour of the leather produced by these various barks, the following observations may be recorded:—

Nos. 1, 4, 8, 10, 11 were similar in appearance and colour, and would probably produce a good leather of light colour.

Nos. 2, 5, 7, and 9 gave a reddish tinge to the leather, and would not be considered so satisfactory as the preceding numbers.

No. 3 was of indifferent quality, having a decided purplish tinge.

No. 6 was very heavily coloured, giving a deep brick-red coloration and harsh character.

It is not to be understood, however, that we place too much reliance on this classification. We recognise that it is only by practical trial in a tanyard that the real value of a bark can be ascertained; and it is in the hope of attracting the attention of practical tanners to these barks for that purpose that these results are published.

While it will be seen at once that none of the other barks are equal in value to the "Mallets," and none of them practically rich enough for direct payable use in tanning, the majority of them could probably be used with great advantage in the preparation of tanning extracts, provided that the leather produced is found on trial to be of good quality.

We have been much indebted to Mr. B. Rosenstamm, of Perth, and Mr. L. Benjamin, of Footscray Tannery, Melbourne, for advice and assistance in connection with this investigation.

A further investigation has now been begun as to the percentages of tannin contained in the woods of the above trees, as well as some other Western Australian barks.

We hope to publish these results at an early date.

* H. R. Proctor, "Princ. of Leather Manufacture," p. 294.

THE DAIRYING INDUSTRY.

THE EXAMPLE OF DENMARK.

By C. F. Chaplin, Director of Agriculture.

Before directing attention to the rapid expanse in the Eastern States, a few examples of other countries may serve to emphasise what has been done by tuition under the auspices of the State; and notwithstanding that our farmers are not any less intelligent here than in other progressive countries, there is no State that requires fostering care in valuable, and what may be considered scientific industries, more than does this. The many problems of stock-feeding, butter and cheese making, have not all been solved yet—not even by the greatest scientific workers in the world.

I had a book sent me a few days ago by Sir Herbert Chermside, formery Governor of Queensland, and now of Newstead Abbey, Nottingham, England. This book is a compilation of a series of articles by a *Times* correspondent, and is entitled "The Organisation of Agriculture." Reference is here made to the wonderful development of Denmark as distinguished by its dairying and other rural industries. It is an example of thrift and scientific research worthy of the emulation of any country. Left by the Napoleonic wars, Denmark was little more than the wreck of a country, and even at the beginning of the last half-century the manufacture of butter was only of secondary importance, the cows being inferior, the yield of milk small, and the butter, made in ill-equipped dairies, very indifferent in quality. In 1860 Professor Segelcke began his efforts to place the industry on a rational and scientific basis, but close upon this followed the disastrous war with Prussia and Austria, as the result of which Denmark lost two of the fairest and most fertile of her provinces, and was thus reduced to the narrow limits of the islands and of Jutland. Even of this area a substantial proportion consisted of moor, marsh, and dune land, fit apparently for nothing but for the wind to blow over. On the top of all this came the fall in the prices of corn, which had hitherto been the staple product of Denmark; but its cultivation was found to be no longer remunerative.

Comparing the position of Denmark and of Great Britain respectively in the era of agricultural depression brought about at this period, it is evident from the circumstances narrated above that the former country found herself in much worse circumstances than the latter; but this very fact, perhaps, had a good deal to do with the greater degree of vigour shown by the Danish agriculturists.

As Mr. Pratt, the writer of the *Times* articles referred to, points out, the whole story of the way in which the Danes, in their diminutive and at one time hardly-pressed country, overcame the disadvantages of their position and boldly met and were made the stronger by adverse circumstances, is one that will bear re-telling, and is, indeed, one that cannot be told too often to the agriculturists of other lands, who may feel depressed because their own conditions are not all that they would like them to be.

Sample No. 6 has a peculiar character; though it apparently acts upon the hide-powder in the ordinary way, it does not react with iron salts like an ordinary tannin, and presumably true tannins are absent from this bark.

It would appear from the above reactions that the tannins all belong to the catechol rather than the pyrogallol class.*

As regards the colour of the leather produced by these various barks, the following observations may be recorded:—

Nos. 1, 4, 8, 10, 11 were similar in appearance and colour, and would probably produce a good leather of light colour.

Nos. 2, 5, 7, and 9 gave a reddish tinge to the leather, and would not be considered so satisfactory as the preceding numbers.

No. 3 was of indifferent quality, having a decided purplish tinge.

No. 6 was very heavily coloured, giving a deep brick-red coloration and harsh character.

It is not to be understood, however, that we place too much reliance on this classification. We recognise that it is only by practical trial in a tanyard that the real value of a bark can be ascertained; and it is in the hope of attracting the attention of practical tanners to these barks for that purpose that these results are published.

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In our peaceful country no war beyond the usual civil war of politics is likely to "dull the edge of husbandry," and our prospects generally are infinitely better than were those of Denmark 40 years ago. Reduced to the proportions of a dwarf, Denmark fought against adversity with the courage of a giant, and, crippled though she was, she not only regained her strength, but became a power in the commercial world with which other nations have had seriously to reckon.

Having lost Schleswig-Holstein, the Danish people set about reclaiming and bringing under cultivation moor, marsh, and dune land, of which the surface of Jutland then so largely consisted. In the days of ancient history there were extensive forests in this part of Denmark, with good pastures, which, together with the abundant crops of acorns, afforded ample food for the swine that were kept there. But in the course of centuries the trees gave way to brushwood, the brushwood was succeeded by heaths; the pastures disappeared, and a previously fertile district became little better than a desert waste, where even so late as 1850 one could wander for hours without seeing a single human habitation.

At that time the extent of these Danish "landes" represented a total of over 5,000 square miles, and the conditions were but little improved, if at all, in 1866, when following on the war, one of the most practical of Danish patriots, Colonel Dalgas, started the Danish Heath Society, with the idea of bringing the area in question under cultivation. The final outcome of the society's work was that 25,000 acres of sandy land have been converted into productive soil; 75,000 acres have been planted with conifers, two experimental stations have been established, and 400 demonstration fields have been orgainised in all parts of the country where heath land is to be found. All this good work, Mr. Pratt says, is still going on.

The Danes, however, mainly found the means of recovering from the crisis which had overtaken their economic, and especially their agricultural, conditions in the development of the dairy industry; but this relief was secured only as the result of prolonged experiment and much patient effort. The spread of an extremely practical scheme of natural education and especially agricultural education, prepared the people of Denmark to take advantage of the coming transformation. Learned professors had placed the working of the industry on a more scientific basis, thus facilitating operations, reducing expenses, and allowing of far better and more profitable results being obtained than had been the case before.

Probably one of the most striking outcomes of these various conditions was a resort to co-operative dairies, so that the agricultural classes could get a maximum of possible benefit for themselves. There are now 1,050 of such dairies in Denmark, with 148,000 members, owning 750,000 cows, out of a total of 1,067,000 milch cows in the country. In 1902, the year for which the last statistics are available, Denmark exported—mainly to Great Britain —168,000,000lbs. of butter, 135,000,000lbs. of this total representing home produce, and the remaining 33,000,000lbs. butter received from Sweden and Russia for treatment. The total value of the butter imports into Great Britain from Denmark in 1902 is given at £9,302,000. The amount invested in the equipment of dairies is over £1,500,000.

The practice usually adopted is for about 150 farmers in a particular district to raise, say, £8 each, this sum being sufficient to provide a dairy

which will deal with the milk of 850 cows. The establishment of the co-operative dairies has been followed by the founding of societies for the sale of butter, together with some 200 central unions, which employ capable men to take periodical tests of the milk on the farms of the members, and see which particular cows gave best results, according to the quantity and cost of food consumed.

Denmark comprises a total area of about 15,000 square miles—a country which we could place in one corner of this State, and then, in a manner of speaking, hardly notice it. We have here the country, but we want many thousands of people with the same industrial and energetic capacity as the Danes.

In the Eastern States the dairying industry has made rapid advance, the fostering care of the State authorities acting as a great instrument in creating an incentive, which has caused a mine of wealth to be more deeply tapped than the most sanguine ever contemplated. In Victoria large sums of money were devoted by the State to stimulating an export trade in dairy products, with the result that in this regard over £1,000,000 per annum has been reached.

Western Australia is, however, differently circumstanced to the other States. The natural grasses here are not prolific or nutritious enough to insure feed for the cattle; and it is obvious that both exotic and indigenous grasses must be laid down in such a manner as will enable reliable pastures to be maintained to some extent, at least, all through the summer. Then, again, fodder must be conserved in the silo; and methods of conserving silage will require to be demonstrated in each district.

At the Narrogin State Farm, dairying is to be initiated this season, on an extended scale; and, as an experiment, the improved milking machine will be installed. If this machine is a success—and there is evidence that it is likely to be so—the labour difficulty, which is now continually advanced against dairying in this country, will be, in the main, obviated. In all the States, the labour question has been raised—yet the dairying industry extends. The milking machine, however, if as successful as it is claimed to be, would, no doubt, bring about a general expansion of the industry in Australasia.

The main object of the department in experimenting in dairying is to demonstrate its paying capacity. To accomplish this, it will be essential to grow fodder crops for conservation, as ensilage, root crops, and to maintain permanent pastures. We send away a large sum of money (nearly £400,000) for dairy products, and up to this limit, with an increasing population, a good local market is for the time being assured. A practical example, through the agency of a State Dairy Farm, may be commenced in other localities during the year. In the meantime, a beginning is to be made in the State Farms already existent.

I have specially cited Denmark as a country worthy of emulation because of its rapid development in such industries, but there are other countries equally progressive in Europe. America, New Zealand, and the Eastern States of Australia have also done well; then why should not Western Australia, with its closer proximity to the markets of the world, take a hand in serving out dairy products? Compare Denmark, with its 15,000 square miles of country—inferior to this as regards soil—exporting

annually over £9,000,000 worth of butter to great Britain; and our State buying butter from other States to the extent of nearly £400,000. We must certainly soon begin to rub our eyes to ascertain if we are yet really awake to the position. And this is only one item. When we enumerate the money we actually send away for other products, which we should be selling, rather than buying, the situation is, indeed, perplexing.

WESTERN AUSTRALIAN FAUNA.

COLLECTION FOR BRITISH MUSEUM.

The following interesting interview with Mr. Shortbridge has been published in the *West Australian*, and is here reproduced for the benefit of our readers:—

"The ramifications of the British Museum extend throughout the world, and in almost every known country native fauna are collected in order that specimens may be preserved in the magnificent institution devoted to that purpose in the world's metropolis. Western Australia has not been overlooked by the authorities of the British Museum, and since November, 1903, a naturalist attached to the Museum staff has been travelling through this State collecting birds and animals. To show the extent of the operations, it may be stated that Mr. G. C. Shortbridge, the naturalist in question, expects to remain in Western Australia altogether for three years. He has already been to Albany, Southern Cross, Kurrawang, and Laverton, and is now at Beverley. He intends to visit Katanning and the Leeuwin next month, and in March, when the worst of the hot weather will be over, he will go to Wyndham and start on a long trip down the coast. Mr. Shortbridge is a comparatively young man, and has been employed as a collector for the British Museum for about four years. He is now in Perth on a short visit and was interviewed by one of our representatives yesterday.

"The personality of a naturalist is most interesting, for he lives a life so different from that of the ordinary man. He is rarely found in the usual haunts of men, but is always on the move in the uninhabited portions of the continent to which some special sort of beetle, snake, bird, or beast has attracted him. Armed with a shot gun, quantities of traps, and collecting boxes, his life is devoted to the capture and study of the various forms of life of the feathered and animal kingdoms. Mr. Shortbridge is full of interesting accounts of what he has seen and found in Western Australia, and he is quite enthusiastic about some of the results of his trip. 'Yes,' he said, in answer to a question, 'the life is liable to become rather a lonely one, for I am always away from habitations, and it is not always that I can get a man to go out with me and help in my operations. However, the prospecting for new forms of life is highly interesting, and one feels like the

mining prospector in that any day may bring to the gun or the trap a new discovery. On the present trip I am practically limiting my researches to animals and birds, and I expect to have an especially resultful visit to the North-West of this State. I hardly expected to find anything very new in the South-West, but I managed to secure some very interesting specimens of bats which are new to Western Australia—I cannot say that they are all new to the known world, but at all events one or two of them are. This is very important, for, as you know, the bat is very high up in the animal kingdom —in fact, next to the monkey—and anything fresh about them is eagerly sought for. They are all insectivorous bats.

"'During the whole of my tour so far the most wonderful things I have seen are the birds in the dry and salt portions of the fields. During the four months I was on the fields I got nearly 600 birds, of about 120 varieties. This is remarkable, because there was practically no fresh water there, and it is wonderful how they got supplies there at all. I was very much surprised to see at Southern Cross large flocks of the freckled duck (*Stictonetta nævosa*). From the information which we have in the British Museum those birds are very rare in Australia—in fact, the rarest bird of all. They were at Southern Cross in these large flocks for but a short time—only about a week—and I consider myself very lucky indeed to have managed to get hold of a specimen. These birds are just about the same size as the black duck, and it is known that their headquarters are generally in the interior of Western Australia. Another thing that struck me with wonderment was the large number of North-West birds that come down to the fields, but never visit the coast. I am confident that when comparisons come to be made between my specimens of birds and those at the Home Museum it will be found there are several of the former which were not known of before. An interesting find at Southern Cross was the ordinary porcupine, of which I got several. These will be the first for the British Museum from Western Australia. I think that they are rare here, although I know that your museum has got some from Geraldton and other places. During my trip so far I have got about 30 kinds of animals, from the kangaroo downwards. I did very well at Albany, obtaining a large number of various kinds of waders, such as sand-pipers, plovers, etc. For shooting I use a No. 12 double-barrelled breechloader, loaded with small cartridges, and then I am ready for anything, big or small, that may turn up. For catching the animals I always have with me about 200 traps. One of the good things which I secured at Albany was a specimen of the tarsipes, which is a honey-eating opossum-mouse. It is one of the smallest kinds of opossums known, and the only place in the world where it is found is at Albany. It would be idle and too lengthy for me to go over in detail the various kinds of animals which I have discovered so far in Western Australia; suffice it to say that the trip has been interesting and beneficial. I expect to get some excellent collections along your north-western coast.'"

HOW WEED SEEDS ARE DISTRIBUTED.

Weeds that depend for reproduction upon their seed alone, produce them in large numbers, says a bulletin issued by the Dominion Department of Agriculture. A single plant of false flax will mature from 25 to 30,000 seeds, and, although we sometimes have reason to doubt the vitality of the seed of corn or mangels that we buy, we need have no misgivings as to the vitality of those weed seeds. The seed of those weeds that mature in our grain crops, even though it shells out on the field, is with difficulty induced to germinate at a time when it can be destroyed. Some of it can be persuaded to grow by stirring the surface soil directly after harvest, but most of it will not germinate until it gets ready. Thus nature provides for the perpetuation of the species. In the seed laboratory at Ottawa 100 fresh seeds of wild mustard were planted in good soil in a box, and under the most favourable conditions only 35 of them could be induced to grow. The box was then placed in the open air for a week with the thermometer below zero; when again put in the germinator, 17 more of the seeds produced plants. The soil was then allowed to become thoroughly dry, and again put out to freeze, after which, 12 more of the 100 seeds germinated. This operation was repeated several times, until finally every seed demonstrated that the mother had not lived in vain. As a rule the seeds of the more noxious weeds that grow from the seed alone, retain their vitality for several years when embedded in the soil. It is highly important, then, to prevent the formation of seed. It is quite evident that many fields throughout Canada have now a sufficient stock of seeds to produce luxuriant crops of weeds for several years, but by adopting a suitable rotation it is possible to prevent most of the plants from these seeds coming to maturity.

All will agree that most districts have their full share of weeds. Like the poor, they are always with us. How do we get them? Many farmers can doubtless remember when the Canada thistle was a new weed. Perennial sow thistle, ribgrass, ragweed, bindweed, and some others are of more recent introduction. There are many more to come, and some of them are ever more noxious than those that are now common. For instance, there is the devil's paint brush, or orange hawkweed, that is already well distributed over the eastern townships of Quebec and part of New Brunswick. Where this weed has become well established land that was worth 40 dollars an acre five years ago could not be sold for five dollars an acre to-day.

There are also a number of weeds that have been recently introduced into Western Canada, and which have proved to be exceedingly dangerous. Most of them were brought in by immigrants. Among them are tumbling mustard, hare's-ear mustard, and field pennycress or stinkweed. A few plants of each of these have been found in different parts of Ontario during the past season, and the East will know more about them later. One thing seems clear, and that is that the weed pests are now gaining headway at a much more rapid rate than they did 25 years ago. How can we account for this?

The investigations of the Seed Division have shown that the seedsmen are to blame to a considerable extent, but there are many other means by

which weeds become disseminated, and which are worthy of consideration. Any farmer who has land that is annually flooded by freshets knows the difficulty of keeping such land free from weeds. Transportation companies, particularly the railway companies, have much to do with the introduction of new weeds. Most of our noxious weeds are introduced from Europe. Their seeds are often brought in with material that is used for packing articles of commerce. This packing material is scattered about on the ground and the seeds soon germinate. In three or four years the new weed may be found on a large number of farms. That is the way most of our weeds come to us.

The wind and animals of various kinds do much to spread weed seeds in a local way. Seeds of many weeds are provided with special facilities, some like small parachutes, as in the dandelion and Canada thistle, by the aid of which the seeds are carried long distances by the wind. Nature provided seeds of other weeds, such as burrs, with the means of clinging to the wool of sheep or to other animals, in order to insure their distribution. In any case it is the seed that comes first; the weed curse follows.

RUBBER-PLANTING AND PROFITS.

Mr. Dacre T. Edwards writes as follows to the *Financial News*, referring to the rubber industry as one which promises to be a veritable gold mine to the planters engaged in it, and in view of the suggestion lately made by a correspondent that this State presents opportunities for the cultivation of rubber, his remarks are not without interest to West Australians:—

"When tobacco planting was first taken in hand by Englishmen in Borneo they very naturally endeavoured to sell their produce in London, hoping to make that a centre for realisation. They soon found out, however, that they were doing so only at a disastrous cost to themselves, and wisely realised that in business no sentiment should be allowed to exisi, and that, as long as they got a good price, it was immaterial who paid it. The result is that now all British-grown tobacco is realised in the great Dutch markets. The same thing will undoubtedly take place in rubber. Great Britain as a market sinks into insignificance when compared to Antwerp and New York, and the sooner planters in the Malay States and Ceylon realise this the better it will be for them. It is the Continental and American buying in Colombo and Singapore which accounts for the prices realised there for rubber being so much above London parity. I believe I am correct in stating that practically the whole of the Straits and Ceylon rubber hitherto shipped to London has been bought for either American or Continental account. I have frequently heard men in Mincing-lane say, "Why should Straits and Ceylon rubber fetch a shilling a pound more than fine South American Para?" The reply to this is simple; fine South American Para contains from 18 per cent. to 20 per cent. of impurities and shrinks to that

extent when subjected to the necessary washing process. Cultivated Straits and Ceylon rubber is practically pure; in fact, the creped rubber which is now being shipped is so pure that the expensive process of washing becomes entirely unnecessary, and the cost of labour entailed by running the washing machinery, a very considerable item, is saved. On the Continent and America the economy of buying pure Straits and Ceylon rubber at 1s. a pound over the rates ruling for South American Para has been quickly realised, but in England it has apparently been entirely overlooked.

"Great surprise has been evinced at the large premiums at which the shares of all the leading British rubber-producing companies now stand. The reason is that it is only now beginning to be realised that a quicker and much greater yield may be expected than was originally anticipated. However, one must remember that most of the companies formed, so far, have been brought out by firms of the highest standing, who have no doubt been anxious not to overstate the possibilities. For instance, instead of not being able to tap the trees until they are six years old, one knows that they can commence tapping at four years, and, moreover, a tree ten years old will yield more latex if the tapping commences at four years than if it had been left untapped until six years old. Tapping trees at four years old does them good and increases their yield as time goes on. Again, a tree eight years of age, instead of yielding from 1½lb. to 2lb. of rubber per annum, the amount which I understand has formed the basis of the probable returns foreshadowed in the prospectuses of the companies to which I have referred, will in all probability yield double that amount. Before concluding, I should like to sound a warning note. Notwithstanding the brilliant prospects of those companies which are operating in the Straits and Ceylon in cases where they are moderately capitalised and well managed, and where the suitability of the soil and the price of labour has been carefully studied, it goes without saying, since the subject of rubber cultivation has been brought into such prominent notice, that a lot of companies will be issued operating in various parts of the world where the conditions necessary to success are non-existent."

COTTON-PICKING MACHINE.

The *Home and Colonial Mail* gives the following general description of Mr. G. A. Lowry's latest invention of a machine for picking cotton. Should the reports concerning the performances of the machine be correct, and we have no reason to doubt them, then a great revolution must take place in the cotton-growing industry. The cost of picking the American cotton crop at present amounts to £5,000,000, and it is claimed that by the use of Mr. Lowry's cotton-picker the cost will be reduced to £1,000,000. This means that many thousands of acres will be placed under cotton in addition to the present area. It also points to the possibility of large cotton plantations being established in Queensland, and, most important of all, the price of cotton will be considerably reduced. This, however, would not seriously

affect the profits of the grower, because whereas hand-pickers rarely average 100lb. a day throughout the picking season, each man on the automatic picker can gather in 500lb. per day. Thus with a machine carrying four operators and one motorman, 2,000lb. of cotton, or, say, the produce of two acres, could be harvested daily. We hear as yet nothing about the cost of the machine, which will probably be considerable, and it does not strike us as at all likely to be used by small growers, nor even by a combination of growers in a district on the co-operative principle, because, as soon as the cotton bolls have burst, the cotton must be gathered in, and all or most of the fields in a district would require the services of the machine at the same time, and, if the cotton were to be left on the bushes for two or three days awaiting its arrival, serious loss would be sustained by the grower.

The report alluded to says:—

The reports received from America of the new automatic cotton-picker go to show that a practical solution of the cotton-picking difficulty has been arrived at. A Mr. Lowry has invented a machine which has excited the greatest interest in the cotton-growing regions. It has been subjected to some exhaustive tests under the supervision of Mr. R. H. Allen, of Memphis, who was appointed to investigate its work, and it appears to have justified its claims. It is a motor-driven vehicle, fitted with eight arms of aluminium, delicately balanced, so that they can be moved in all directions. These arms are fitted with endless belts, covered with wire hooks, and to each pair of arms a boy or man attends. The machine passes down the rows of cotton plants, and the operators direct the arms to the opened bolls; the wire hooks seize the lint, and pass it along to a brush, which gathers it up and collects it in a receptacle. The process of picking by hand is done with much effort by the negroes, who pull off the lint with their fingers, and place it in a bag suspended from the shoulders. The operators sitting on this motor-frame merely point the arms under their control to the lint, and, if only a few of the fibres are seized, the whole of the lint is drawn away to the brush.

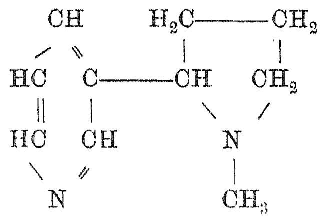
The report of Mr. Allen on this machine is certainly favourable. Tests conducted with a machine having only four arms showed that the two lads who operated it got results equal to a pick of over 500lb. of cotton per man per day. Their capacity as hand-pickers in similar cotton would have been about 65lb. per day; but the work was not merely greater—it was better done; there was less "trash," such as sticks and dirt in the cotton, and its quality was several degrees higher than that picked by hand in the same field. If the machine can be improved still further and made really serviceable, it will certainly work a revolution in the conditions of the industry, which is already restricted, owing to the scarcity of labour at the busy time of harvest.

THE CHEMISTRY OF TOBACCO.

The tobacco industry has at the present day grown to very large dimensions. The total world's production of this plant is estimated at 2,200 million pounds per annum, of which about 770 are contributed by Asia, 660 by America, 550 by Europe, and 35 by Germany. An idea of the revenue derived by governments from tobacco can be gathered from the fact that in France it figures out to about 7s. 3d. per head. The price of different brands varies within wide limits; while Kentucky plug can be bought for 7½d. per pound, the best Havana will fetch £6 15s. to £9 10s.

As regards the chemical composition of tobacco, the first point to note is the high percentage of mineral matter generally, and of potash and lime in particular. The tobacco leaf contains on an average 15 per cent. of pure ash, consisting of 30 per cent. potash and 36 per cent. lime. It is evident from this that the tobacco plant can flourish only in a soil rich in these two bases.

A constituent of tobacco which is of particular interest is the alkaloid nicotine. This hasrecently been synthesized by Pictet, whose work confirms the formula proposed twelve years ago by Pinner, the body being a product of condensation of one molecule of pyridine and one of methyl pyrrolidine :



The method usually employed for the determinatfon of nicotine in tobacco is to render the material alkaline, extract with ether, and to isolate the nicotine by steam distillation. The nicotine content of tobacco varies from 0·5 to 5 per cent. A cigar with more than 2 per cent. of this alkaloid is quite strong, one with about 3 per cent. can hardly be smoked.

Two other important constituents of tobacco are the fixed organic acids, especially malic and citric acids, and the tobacco resins. The former are important factors in determining the smouldering of the material, while the latter largely influence its aroma. Tobocco contains on an average 8 to 10 per cent. of these two classes of substances.

The method of cultivation of the tobacco plant presents some points of interest. The seed is first of all sown in carefully prepared beds, and after eight weeks or so the young plants are transplanted to the open fields. As they grow, the infloresence and the lateral shoots are cut off, so as to encourage as far as possible the development of the leaves; finally these are gathered when ripe.

The tobacco seed is exceedingly small, about 780 seeds weighing one grain. About 50,000 seeds are sown per acre, of which about only one-third

develop into plants. The tobacco plant requires a very loose soil, and the ideal soil for it is the layer of humus which is left on the land after the deforestation such as exists in particularly fine quality in Sumatra. Unfortunately, this virgin soil loses its valuable qualities very largely even after the first crop. In the tropics it has been found possible to work with an alternation of crops, growing tobacco for one to two years, and then allowing the land to become covered with woods during a period of six to eight years. This of course is possible only in the tropics.

In consideration of the high potassium content of tobacco, particular interest attaches to the question of suitable potash fertilisers for this plant. Nevertheless, nothing positive can be stated as to the best mode of fertilising, all observations made hitherto having failed to lead to any definite conclusion.

Much interest has also been aroused by a method which was said to produce excellent crops on old fields, and which consists in growing the tobacco under sheds. According to the latest reports, however, it appears that although this method has proved very satisfactory in Cuba, protecting the plants from excessive solar radiation, in Connecticut the attempts made in this direction have proved a complete failure. The matter can not, however, be considered settled.

An aim which naturally suggests itself, that of producing a tobacco which combines in itself the advantages of the Havana and the Sumatra varieties, is not likely ever to be realised as these two, in order to have their special qualities properly developed, require totally different treatment during their period of growth.

A point which has been much studied, but which, owing to its complexity, is very difficult to clear up, is the influence of the methods of cultivation on the smouldering quality of the tobacco. But so much seems to be established, that potassium has a favourable influence, while the opposite is true of chlorine, and further, that the favourable effect of potassium is marked only if a considerable proportion of that base is bound to fixed organic acids, *i.e.*, when the ash has a comparatively high basicity. According to P. Wagner, the percentage of potash in the dry material must not sink below 5 per cent., that of chlorine must not exceed 0·6 per cent. A high percentage of organic acids favours the smouldering process, more especially in that it leads to the formation of a loose ash. As regards the influence of the other organic constituents, opinions diverge, but it seems fairly certain that the albuminoids affect the smouldering less than the odour of the products of combustion, upon which they have an unfavourable influence, while the resins, on the contrary, are prejudicial to good smouldering qualities. The structure of the leaf is apparently also of great importance. The conditions are evidently complex, so that it is easy to form erroneous conclusions from field experiments.

During the drying of the tobacco, which has to be performed with care, the carbohydrates disappear, the albuminoids are decomposed, with formation of amides, the brown, incompletely investigated tobacco pigments are formed, etc.

Very interesting are J. Mohr's investigations on the migration of substances which takes place in the tobacco leaves left on the plant. Mohr has shown that a number of substances pass from the leaf into the stem, namely, those which are of physiological value. The plant withdraws from

the dying organs, the leaves, the materials required for the nourishment of the lateral shoots and the inflorescences, *i.e.*, the parts upon which depends the perpetuation of the species. Lime and magnesia are left almost entirely *in situ*, sulphur is transferred in greater quantity, next come chlorine and potash, and highest of all stands phosphorus. As regards the organic constituents, the starch is dissolved, the sugar is partly oxidised off by respiration, partly transported to the stem. Amido and amino compounds are transported freely, and also ammonia, while nitrates and albuminoids show much less tendency to migrate, and least of all does the nicotine.

The fermentation of tobacco is a process which goes on with spontaneous liberation of heat, and which, according to Suchsland, is determined by certain bacteria, while Löw maintains that it is due to enzymes, of which he has isolated a number. Two methods of fermentation are used. In the one case the bunches of leaves are stacked up in heaps, and the temperature, which soon rises naturally, is kept at about 60deg. C. by frequently opening up the heaps and resetting them. In the other case the bundles are hung up loosely. In this latter method, in which also the temperature is carefully regulated, a very much more extensive oxidising action takes place. This method is principally used in North America. Each of the two processes has its advantages and disadvantages, but for the better qualities of tobacco the fermentation in heaps seems to be preferable.

A good deal of energy has been expended by inventors on the attempt to free tobacco from its most active poisonous ingredient—nicotine. The idea appears to be prevalent that what is wanted is a suitable oxidising agent, and so the patent literature contains a somewhat fantastic selection of oxidising processes which have been proposed. Probably the best attempt in this direction is that of Siemens & Halske, who effect the oxidation by means of their ozonizer; recent tests of this process, however, seem to indicate that no notable success can be gained by this means.

The numerous patents dealing with the removal of nicotine from tobacco can be divided into four classes: 1. Those depending on the extraction of the nicotine. These suffer from two flaws: first, they are two expensive, and secondly, they mostly injure the quality of the tobacco. 2. Those depending on the volatilisation of the nicotine. Little is known about these. 3. Processes depending on the fixation of the nicotine. This fixation is generally quite ineffective, for in the smouldering of the tobacco the nicotine is again liberated. 4. Processes depending on the absorption of the nicotine in the smoke. To the chemist who is familiar with problems of absorption, the question will immediately suggest itself whether any approachingly complete absorption can take place when the smoke is passed at a comparatively high speed through the absorbent.

The composition of tobacco smoke has been fairly completely investigated. Its strongly poisonous constituents are nicotine, pyridine, an empyreumatic oil of unknown constitution, carbon monoxide, hydrocyanic acid, and sulphureted hydrogen. The last three occur in such small quantities that they hardly enter into consideration as regards the physiological action of tobacco smoke. The most important of these constituents is nicotine; chronic tobacco poisoning resembles acute nicotine poisoning very closely.

The percentage of nicotine in the smoke is in general determined only by the nicotine content of the tobacco from which it is produced, but the

relative proportion of nicotine which passes from the cigar into smoke depends principally on the length of the unconsumed portion of the cigar, as the nicotine content of this portion is inversely proportional to its length. Only a comparatively small proportion of the nicotine is destroyed in the process of combustion of the tobacco.

The advice to be given to any person who has cause to avoid the effect of the heart and nerve poison nicotine, and who nevertheless can not resign himself to abstain from smoking, or to smoke only tobacco free from or poor in nicotine, is that he should always smoke only so much of each cigar as to leave about three-eighths unconsumed.—From an article by R. Kissling in the *Zeitschrift für angewandte Chemie.*

Notes on the Chapman District, by the Manager of the State Experimental Farm.

DECEMBER, 1905.

Harvesting operation are nearing completion in this district. The yields generally are higher than those of last year, this no doubt is due in a great measure to the large area of virgin land put under cultivation by the new settlers.

That the land of this district is suitable for the growth of cereal crops is amply proved by the results obtained this season. On the old fields, which have been under cultivation for many years, yields of from 16 to 20 bushels of wheat to the acre have been obtained by the aid of fertilisers; while on the land more recently brought under cultivation, 24 to 30 bushels have been harvested.

Stripping is the general rule in this district, no matter whether the crop is wheat, oats, or barley. Only one or two farmers do any thrashing, and then only when the crop is an oaten one.

Thrashing operations on the farm were commenced during the month, and will be continued without intermission until the work is completed.

The rainfall for the month was 34 points, which benefited the melons and pumpkins very much. The vegetable marrows which came early have been most useful to us since the other vegetables, such as cabbage, etc., dried off. Water melons are now coming in, and the crop of citron and pig melons is very satisfactory.

Fodder Crops.

The fodder crops have not been a great success this season, although we find those that have succeeded at all are very useful for pig feed, and also for horses and cattle.

Of the sorghums that have done best are "Early Amber Cane," "Broom Corn," "Planter's Friend." Ninety Day Maize, although affording a bite for stock has not done well. It attained a height of two feet and then, owing to the lack of moisture, dried off.

The millets, like the sorghums, have not been a success, the season proving too dry for them. Next year I shall put these crops in a month earlier, which will give them the advantage of a longer growing season.

The stock are all in good condition. The Shropshire lambs have done remarkably well. All the lambs have been weaned and the rams have been put with the ewes.

The stallion season is now almost closed, most of the mares sent to the farm have been removed, and our own mares are nearly all stinted.

NARROGIN EXPERIMENTAL FARM.

REPORT FOR DECEMBER, 1905.

By Frank L. Faulkner.

Since my last report we have had rather unseasonable weather, several thunderstorms and a considerable amount of rain being recorded. All the hay was harvested and housed before the rain, and most of the wheat for grain was cut and in the stook. Many of the stooks had to be opened up, dried, and restooked; but, other than a little mould on the chaff, no harm has resulted.

The cutting is now complete, and now the new year is begun we shall get on with the threshing. The second-hand engine obtained from the Public Works has been got into going order, and is a great improvement on the tread-power, and the wind-motor, both of which, I am glad to say, we can now discard.

The stock on the farm are all in good, strong, healthy condition.

The cows are looking very well; but, owing to the dryness of the pasture, are not milking so well.

Several of the cattle and the Angora goats have been giving considerable trouble with the fences. The only fence that keeps the Angora effectively is the netting, and the cattle pull the cyclone and other short-dropper fences about very badly. During the month we have lost a number of the Angora kids from poison. The kids are very difficult to fence, and readily take to poison. The poultry are not laying so well as they have been, and we have stopped hatching some time back. A good lot of turkeys, geese, and chicks have been reared this season, although they are mostly all rather late owing to our very wet winter and the cold bleak aspect of the poultry runs.

Pigs are doing very well and have been feeding almost wholly on peas for the last two months. The peas were harvested with the horse rake, and instead of threshing and winnowing, harlins and all are fed for the pigs to do their own threshing.

In the orchard most of the trees are growing and doing very well. A few very fine samples of peaches set and ripened well on the "Triumph" variety, and a few Japanese plums have also set to fruit. I have to report failure again in the upper (very sandy) portion of the orchard. This portion has been twice planted, but the trees scorch and die off with the hot weather. This piece of country is very poor white sand.

Vines even in the white sand have made very satisfactory growth this season and have already a nice crop of fruit on several of the varieties, notably, Muscat, Alexander, Raisin de Dames, Flame Torkay and Wortley Hall.

Pumpkins and melons are not doing as well this season as they did last, and in addition the Ringneck parrots are doing a lot of harm by very persistently nipping off the runners.

French beans, Cape gooseberries, and tomatoes are doing very well.

Sixty hop sets have done very well, and already have runners 6 to 8ft. high.

Small patches of maize, sorghum, and millets, of which we have a large variety planted, are doing fairly well and will give a little green feed for the stock.

Of the grasses Paspalum, Dilatatum, Virgatum, and Distichum continue to do well as does the Nigrostis Pilosa and Rhodes grass. African Wonder grass is not growing so freely and is being eaten a little by the cut worm.

The potato crop is now just on ready for lifting and the results of them, as well of the wheat varieties and manure test plots, will be available for next month's report.

ANTIDOTES FOR POISONING BY YORK ROAD POISON PLANT.

By E. A. MANN, Government Analyst.

In my first Progress Report on the examination of the Western Australian Poison Plants (*Agricultural Journal*, December, 1905), I outlined a proposed method of treating stock poisoned by the alkaloid of the York Road Plant (*Gastrolobium calycinum*).

An attempt has been made during the past week to put the method to practical trial. Mr. T. I. Wallas, of the Agricultural Department, was entrusted with the experiments, which were carried out at the Narrogin State Farm.

The experiments were not entirely successful, as will be seen, but it may be useful to give a few notes from Mr. Wallas's report.

It was arranged to try the two substances mentioned in the above report, viz., permanganate of potash, and tannic acid, administered through the mouth in the form of a drench.

Six sheep were procured for the trials, but their very poor condition rendered them unfavourable subjects for experiment.

Great difficulty was experienced in getting the sheep to eat the plant at all. As it was an essential part of the tests to work under ordinary conditions of ingestion, this difficulty threatened to vitiate the whole experiment. At length, however, the sheep were persuaded to partake of some young green shoots cut up and mixed with chaff. In the case of two of the sheep which were in somewhat better condition that the rest, a fair amount of this mixture was eaten. The others ate very little. Early the next morning one of the two sheep showed evidence of poisoning and was immediately treated with 10 grains of permanganate of potash in acidulated water. The animal became worse very rapidly, and died about 15 minutes later. A post mortem examination revealed a considerable quantity of the poison plant in the stomach, the contents of which were neutral in reaction, and the post mortem appearances (as was also the case with the ante mortem symptoms) were exactly similar to those already observed in my experiments with the pure alkaloid (cygnine) extracted in my laboratory.

The second sheep was simultaneously given, on the 8th inst. (about 9 a.m.), a drench of $\frac{1}{2}$oz. of sodium bicarbonate.* This sheep then showed no signs of poisoning, but developed them within half an hour, when a second drench of $\frac{1}{2}$oz. of tannic acid was administered. The sheep gradually developed symptoms quite as serious as in the case of the animal which succumbed, and two hours later an additional $\frac{1}{4}$oz. of tannic acid was given, and the animal left. It was alive five (5) hours after the detection of the first symptoms, when Mr. Wallas left Narrogin. A subsequent telegram

* This preliminary administration of sodium bicarbonate was given to render the stomach alkaline, a necessary condition for the effective action of tannic acid.

from Mr. Faulkner, of the State Farm, informed me that the sheep was all right again, so that the treatment would appear to have had a beneficial effect.

Two of the remaining sheep were treated, but exhibited no symptoms of poisoning, and had, evidently, as supposed, not partaken of sufficient of the plant.

The plant at this season of the year is very harsh and uninviting, and Mr. Wallas states that on making inquiries he was informed that sheep do not readily partake of it except in the early summer (about October), when it is more green and succulent. He states, therefore, that he thinks it advisable to postpone further systematic trials until that season.

It is interesting, however, to note—

(1.) That the experiments yield further confirmation that cygnine is the true poisonous principle of the plant.

(2.) That the tannic acid treatment seems to offer some promise of success.

(3.) That apparently the symptoms had advanced to some extent before the permanganate was administered, and this, combined with the non-acid condition of the stomach, probably militated against the success of this test.

Both methods should be further tried, and I recommend that this be done at a more favourable season of the year, and, meanwhile, that further experiments be suspended.

I has occurred to me that what it is difficult to bring about deliberately may still happen accidentally, and even in the dry seasons stock are from time to time being poisoned while travelling, or when hard pushed. It seems possible, therefore, that instead of waiting till more systematic experiments can be made, we might invite the co-operation of stock owners in trying these antidotes in any accidental cases which may arise.

If only one or two here and there would undertake to keep the remedies on hand and apply them when opportunity arises, we might still be able to test their efficacy to some extent and obtain information which would be of value when more complete tests are undertaken.

If any who read these lines and wish to take the matter up will communicate with me, I shall be glad to send them the necessary materials with full instructions for use.

It is hardly to be expected that complete success can be achieved offhand; but Mr. Wallas's experiments furnish some very interesting contributions to our knowledge of these plants, and certainly lead me to hope that some method of treatment will be found.

There is no reason why the same antidotes should not be tried with stock poisoned by other plants than the York Road, though we have not yet indentified the principle they contain.

DISTRICT NOTES.

GERALDTON.

By Inspector W. A. Thompson.

I am pleased to state that, taken as a whole, the season has been good in this district, and as a consequence the farmers are having a good harvest. Most of the hay has been cut and stacked, while some of it has already been cut up into chaff and sent away, both north and south; for hundreds of tons are sent up to the North-West ports annually by the fine steamers that ply between Fremantle and Broome.

A great deal of this chaff is used for feeding the cattle (brought down the coast for the purpose of supplying the inhabitants of Perth and Fremantle with beef) during their journey down in the boats, and seeing the large steamers which call in at Geraldton regularly full of cattle, looking in first-class condition, one ceases to wonder where all the chaff goes to.

One firm here has sent away 800 tons for this purpose during the present season.

This district, being a fortnight earlier than any in the Southern portion of the State, gives the settler here a good chance to secure the early market in Perth, when the prices are good and before the market is glutted, which the up-to-date farmer avails himself of. Some, however, complain bitterly about their not getting trucks on the railways in time to catch this market. It means sometimes £5 per truck to him, and it is hard, after taking every possible means of getting off early crops, such as early sowing, and planting early wheats, etc., to find that he is stuck up on account of shortage of railway trucks.

No doubt there is a great demand for these trucks at this season of the year, for truck loads of bales of wool are constantly arriving and departing, for over 10,000 bales of wool have been shipped from here this season, which goes to prove that this district is far and away ahead of any other part of the S.W. districts in the matter of sheep-raising. From what I can gather there is a slight increase in this season's clip over last year, although the new clip has not come up to expectations in regard to quality, for some reasons; possibly the cold, wet weather experienced about shearing time accounts for this.

One squatter has had 30,000 sheep shipped down from the North to one of his stations here, recently, and when I last saw them they had improved wonderfully. One thing about the Nor'-West sheep in these parts is that it will eat almost anything, nothing comes amiss to him; wattles, jamwood, smoke bush, and other scrubs that the locally bred sheep won't look at the Nor'-Wester fattens on.

A peculiar thing about the wattle here is that sheep, even locally bred ones, will eat the wattle which grows inland, and it appears a similar bush, but will not touch the wattle growing on the coast. The sheep from the

North-West do well in this district, but it has been proved that they will not thrive in the Blackwood or Bridgetown districts, the weather conditions being too severe in winter. I think that this would apply to the Great Southern districts also, perhaps not to the same extent; but if the sheep remained in this district for a season and became acclimatised, they would be better able to stand the winter down South. In regard to the wheat yield there will be an advance, both in the area under cultivation, in the Northampton district, and also in the yield on last season's crop, for there will be some record crops. Messrs. Johnston, of Mt. Erin, Smith of Isseka, Wm. Burges of "The Bowes" Station and West of Moonyoonooka, and others have splendid crops. Experiments are being tried with new wheats by the individual farmers, and wheat yield stories are almost as plentiful as snake yarns are at this season of the year. One settler, Mr. Giles, of Moonyoonooka, planted $\frac{1}{2}$ an acre of "new" wheat and reaped $3\frac{1}{2}$ bags as the result, which would mean $29\frac{3}{4}$ bushels to an acre. He is wisely keeping this wheat for seed, and the result next year will be watched in this locality.

The average for this district will, I believe, more than hold its own with such fine farming districts as Katanning and Narrogin on the Great Southern Railway, and this is all the more encouraging when the fact is taken into consideration that 30 per cent. of the crops have not had an ounce of manure.

I noticed when inspecting one small holding that ashes were carted and spread over the wheat field, and then ploughed in, and no other manures used; it was surprising to see the result. The crop was cut for hay, and the reaper and binder had a great difficulty to cut it.

In my opinion, the reason why some of the crops are not as good as they should be, is that in the latter end of August there was some very wet weather, when the crops were well above ground, and then we had suddenly a very dry spell of a few weeks, this caked the surface of the ground, and the crops were too high to admit of the harrows being run over the land to loosen it; had we not had this dry spell I am sure the yield would have been better, but as far as this district is concerned I can see no reason to grumble either at the season or the results. The fact of the Northampton district having 2,000 acres more under crop this season than last shows that it is forging ahead, especially as we are told that other districts are going backward in this respect; and what is wanted is that some capitalist will come along and open up the copper and lead mines which have been proved to exist in this district. I am told the deepest mine is only 140 feet deep, and that most of the others are only surface shows, and lodes have been proved to exist for a distance of 50 miles.

If some of the leading men in Northampton and Geraldton would only bestir themselves and send down to Perth and elsewhere samples of the copper, lead, and iron ores that abound in and around Northampton, it would, I am sure, turn the attention of the capitalist to this district, especially now that the price of copper and lead is so high.

If this were accomplished, I, for one, would have no fear for the result, and once started, they would not be closed down again for want of minerals for some time to come.

To show the good results that must accrue from the establishment of such enterprises, as was made known in the newspapers recently, that of Messrs. Hutton starting a bacon-curing factory at Fremantle, a number of

farmers are already turning their attention to pig-raising on a very large scale. Among others, I notice Mr. Smith, of Isseka, has made a start with some fine large Black English sows, which he intends to cross with the Berkshire. They are a nice lot and have been bred in the State, and should, by the way they are progressing, do well here.

In conversation with Mr. Baird, the courteous manager of the Chapman Experimental Farm, he told me that he has a number of these pigs for sale, both pure-bred and the first cross (large Black English and the Berkshire). Personally I think that the farmer should get the pure-bred pig, for from what I have seen in my travels the first cross is the ideal pig for bacon, as the second cross resembles the Berkshire too much, in my opinion, for a bacon pig, that is: that he has not the length the other has.

As a money-maker on the farm, the pig, when he is of the best kind—and the scrub pig (as well as the scrub farmer) is of no use to these progressive times, and will have to go—and even if the pig is of the purest breed and not well fed and kept in good health, which cannot be done only by cleanliness, he will deteriorate—is one of the best assets. It is said that 12lbs. of pork are made from a bushel of corn, and as high as 15lbs. can be made with the same amount if dairy refuse are given with it; so that in this district, where all cereals grow well, and where cabbage, rape, and other green foods grow almost without cultivation, even if the price of wheat should go down, now that we have a bacon-curing establishment in our midst, the progressive farmer need not worry himself what to do with his wheat, for he can turn it into pork and so send it to the factory; and the pig will do here what he is reported to have done elsewhere, and that is, pay the rent and a bit more.

There is no objection to the pig doing this, but I have repeatedly noticed that some of the settlers here use another animal for that purpose, and that is the kangaroo; not for the flesh, however, but for the skin. One man told me that from the sale of kangaroo skins he not only pays his rents, but has bought enough wire to fence in the whole of his land. In other districts this is not allowed, but is so in this, I am informed. I think that the time has arrived when the kangaroo should be protected here as elsewhere, except for (as is the case in other parts) the purpose of supplying meat to the struggling selector.

It cannot be said that there is a dearth of farming machinery in my district, for I notice at almost every settled farm a complete harvester and a reaper and binder, as well as other usual implements; and it is no unusual thing to see a farmer alone in the field harvesting all by himself, which is a great change from the old days of the sickle, or even the "back delivery." Although the harvester and other modern machinery saves a lot of expense at harvest time, in the way of wages to farm hands, etc., it is a wonder to me how the farmer pays for them all as well as keeping his family (which as a rule is fairly large) and other expenses. Yet in my district, which is about 300 miles long, they all appear contented and prosperous.

There is very little settlement eight miles north of Northampton, yet there are thousands of acres suitable for wheat growing for 40 miles north, which will, in the future, be utilised for that purpose. This country runs in belts: sand-plain, and then rich York gum country, and would be admirably adapted for mixed farming. The rainfall is no doubt lighter than further south, but station holders are, and have been, growing wheat and hay there for years, and have had, I am told, only two seasons out of about

30 of what might be called dry seasons; and even then these squatters admit that their crops are not an absolute failure, and that, given a good season, the yield is far ahead of anywhere further south. In regard to water, I understand that a bore is being asked for in this locality, and judging from the fact that the Geraldine copper mine, which is about 50 miles from Northampton, and which is down about 240 feet, had to be abandoned practically on account of the pumps being unable to cope with the water, there is every reason to believe that artesian water will be struck at a reasonable depth. There are a number of wells in the locality, which prove that water can be procured in places, and any danger of a water famine is not feared.

COTTON.

I understand that an attempt to grow cotton on a large scale is to be made near Geraldton, and already the land has been secured and is being prepared for planting next season. The expert who is having this done is most sanguine of its success, and there is no reason to doubt it, for cotton has been grown as an experiment in this locality. He is well pleased with the land and its position, and he is willing to give any information to farmers, who can, by growing cotton, make yet another addition to his mixed farm, for I believe that £9 or £10 per acre can be made off one acre by this means alone. It would pay some of our progressive farmers to prepare a small plot on their farms, and interview Mr. Cooper, of Geraldton, who will not only give them all the necessary information in regard to the manner in which it is to be planted and cultivated, but will also supply the seed, which is a great consideration, as cotton seed is similar to seed wheat in this particular, that certain seeds grow better in some districts than others.

This seed, Mr. Cooper informs me, he will supply at cost price, so as to introduce it into the district. It is a chance that should not be lost, for this crop does not, I am told, require the very best of land, and its cultivation is not difficult or expensive.

GRAIN SHEDS.

The farmers will have to do here what others are doing in the southern districts of the State, and make some arrangements for next season for storage sheds on the railway at the various sidings. Until recently, a farmer had to sleep at the sidings while waiting for his trucks to come along in order to load, so as to protect his chaff and wheat from the depredation of cattle roaming along the railway line; and, although he is generally a most hardy individual, it is rather much to expect of him after his hard day's work.

He has to dump his wheat and chaff down anywhere, perhaps for a week, and chance whether it rains; if this should happen his labour for the year is lost. There will be, I estimate, 600 tons of farm produce alone sent from Isseka Siding this season and twice that number next, judging from the land being cleared and proposed to be cleared; and it will require all the ingenuity of the Railway officials this season to prevent a block at this particular siding.

This state of things is the same at Northampton, and the settlers along the Geraldton-Northampton line and around Northampton intend holding a meeting after harvest to discuss this matter and devise some means to remedy this state of affairs.

In conclusion, I beg to state that I have again travelled through my district since sending in my last quarterly report, and find that the settlers are doing good work, and are complying with the necessary conditions with few exceptions, and these are being or have been reported on.

QUARTERLY REPORT, NARROGIN DISTRICT.

By Inspector G. M. May.

The all-absorbing topic at present (other than the *pros* and *cons* of municipalities) is: "How will this season's crops turn out?" Hay-making is now in full swing, and the yield immediately around the town will, I fancy, be a little less than the last two or three years, owing to the heavy winter rains affecting the crops on the low-lying lands; the good crops to be seen to the eastward should bring the average well up to that of the last few seasons.

It is yet a little early to say very much about the probable return of grain. The crops on the high well-drained lands, especially to the eastward of here, promise to give very good results, and some should go exceptionally high, but the low-lying poorly-drained fields have suffered very much from the heavy rains in May last, and subsequent heavy frosts in August, which will tend to bring the general average down considerably. The average wheat yield for this district will, I think, be about 10 bushels per acre.

The agricultural shows held at Narrogin and Williams, at the latter end of October, call for a little notice. The latter, held for the first time, was unfortunate to strike a cold, wet day, which tended to keep many away and cause inconvenience to those present. The sheep exhibits were numerous and particularly good; whilst in other respects the show was a decided success for a first attempt.

The Hon. Premier and party, being present at the Narrogin show, were able to gain a good insight as to the capabilities of this district. Messrs. Clayton and Rentoul's exhibit of farm produce and fodder grasses was particularly interesting and instructive, and so much was thought of it by the visitors that arrangements were quickly made to have it taken, in lots, to the Royal Show at Claremont, following a few days latter, where it excited much attention and favourable comment.

As mentioned in my last report, the mallet bark industry has been particularly brisk this year, and it is a pity that this season will practically see this marketable product cut out. Several hundred tons are now being despatched weekly from the local railway station, and all other stations and sidings immediately north and south of here are kept busy through the same cause.

PARASITES IN CALIFORNIA.

Writing to the Sydney *Daily Telegraph*, under date November 28, Mr. Ellwood Cooper, Californian Commisioner of Horticulture, says:—

"I take great pleasure in forwarding to you a copy of our last biennial report, in which, under the title of 'Bug *v*. Bug,' you will find outlined a general description of the work carried on in this department in fighting pests by their natural enemies.

"We have carried on this line of work for the last 20 years, and have imported parasitic insects from different parts of the world, and it has been attended with such good results that we have practically no injurious scale insects to be contended with at this time. By this I mean they are not so numerous as to threaten any of our fruit industries, all being kept in check by some internal parasite or predaceous enemy, a great many of which have been imported into the State through our experts abroad. We have yet two or three scale insects that do considerable damage, but for these we have some checks, although they are not as effective as we could wish, and are now looking for others that will do better work. Among these I may mention the purple scale and the red scale of the orange. We trust that, through Mr. Compère's efforts, we will yet get effective parasites for both of these, when we may safely claim that all of our scale insects have been reduced below the danger limit.

"We have not confined ourselves to work against the scale family alone, but have also introduced beneficial insects for work upon other classes of injurious insects, some of which have given very excellent results. You will find an allusion to this, also, in the article referred to. The latest importation has been the parasite of the codlin moth, which is as yet in the experimental stage, but which has so far done very good work, and promises to be effective. It has proven to be a very effective check on the codlin moth in confinement, and in orchards where it has been established has bred well, and gives good promise for future work. Of course, we are not able at this time to tell what the outcome will be, as it takes four or five years for an insect to get thoroughly established in its new home, and to do the work that is expected."

THICK AND THIN SEEDING.

During a discussion on this subject, carried on in the columns of the *Cultivator and Country Gentleman*, a correspondent contributed the following experience :—

"I was interested in your first article on 'Thick and Thin Seeding.' It may be that some of my experience may be of value to others. The former professor of agriculture in our agricultural college, in our farmers' institutes, strongly recommended thin seeding, asserting that one-half bushel of wheat per acre was enough if sown at the proper season, and for late sowing forty pounds might be better. He said that wheat was its own greatest enemy, that it is natural for it to tiller or stool, and if sown too thickly, there is not room, the stoolings will die, and a small crop will result. It has been the custom with our farmers to sow from one bushel to one and a-half, usually not more than a bushel. It was hard to make farmers believe he was correct, and very hard even to get them to try the experiment. I was led to believe his statement true, perhaps from the fact that when we first began to raise lucerne, we sowed about the usual quantity of grain with it, so as to give the lucerne a better chance, and I think I never saw a time when we did not get a larger yield than when we sowed the usual quantity alone. I remember one of my neighbours sowed two bushels of barley to the acre, and on a field immediately adjoining he sowed one bushel with lucerne, and where he sowed the lucerne he harvested twice as much barley as where he sowed two bushels. It struck me that the best way to settle the question of how much seed to sow was to try both methods.

"I have four men farming my land on shares, I furnishing seed and water. As the yield after a few years fell from 25 to 15 bushels per acre, they asserted that it was because enough seed was not sown; so I told them to sow as much as they pleased. The man who had the newest and best land sowed one and a-half bushels, two others sowed a bushel and a peck, and the fourth intended to sow a bushel, but for some cause he found when he was through that he had sown only three pecks. When the grain was six inches high, the man who sowed a bushel and a-half had the finest field —as fine as any I have ever seen; but at harvest time his was the shortest and thinnest, and yielded the least, while the man who sowed three pecks on the oldest land had the best yield of any. Where one man was sowing five pecks, I got him to sow a few rounds with one-half shut off, and at harvest time (this was on old land) it was plain to see that there the grain was taller, the heads larger, and it ripened more naturally. It was harvested with an automatic binder, and I found that in counting the bundles, one hundred and sixty rods and back, there was exactly the same number of bundles in the one case as the other, but the bundles on the thin sowing were the heavier. At another time, when one of the men was sowing a bushel, I had him sow twenty acres in the middle of the field, running one hundred and sixty rods in length, with exactly one half-bushel to the acre. This was treated every way exactly like the remainder of the field, and was harvested and threshed by itself, and it yielded two bushels to the acre more than the rest of the field."

MIXED FARMING.

To the Editor.

SIR,—The *West Australian*, in a recent issue, pointed out the fact that, while land settlement seemed to be going on at a rapid pace, yet at the same time the acreage under wheat was not increasing as fast as we had a right to expect, and I have wondered why someone did not point out the reason. To me it simply means that areas which formerly were devoted to the cultivation of cereals are now used for pasturage. In other words, the man upon the land is finding out that it is not safe to have all his eggs in one basket; therefore he goes in for mixed farming, which means not only a diversity of crops, but also feeding stock upon the soil. He has found that a few hundreds of sheep, a smaller number of cattle, horses and pigs, bring in a substantial addition to his income, while at the same time the soil is not impoverished, but, on the contrary, it is made more and more fertile as the years roll on. I have heard of a selection which but a few years ago would not support one sheep to ten acres, which now, since clearing, supports one or more to the acre. In other words, as the land is cleared, the native grasses speedily cover the soil with rich, nutritious herbage. This is all very well, but the careful husbandman should at all times be prepared for emergencies which are liable to arise, and to that end he must sow portions of his selection with fodder plants.

There are many varieties, indeed, so many that no district in the S.W. Division of this State can be found where at least one variety cannot be successfully cultivated.

Only a short time ago I visited New South Wales, and there found a farm of less than 600 acres, on which the manager assured me he supported 250 ewes and their increase, 25 horses, 20 cattle, and 50 pigs.

It goes without saying that this could only be done with proper utilisation of the soil.

There is a patch of about 20 acres on this estate under lucerne on low-lying land, where it can be irrigated, but the manager relies mainly upon rape as the staple fodder plant, and he assured me that 40 acres of that crop will carry 10 sheep to the acre for at least three months in the year, at the time when the ordinary pasturage is at its worst. Now I am convinced that if our farmers would go in for that kind of cultivation they would have a handsome addition to their already good income, and to that end your columns should be filled with articles on this most important subject.

Yours, etc.,

Perth, 5th January, 1906. J. H. WILBUR.

PASTURE FOR HORSE BREEDING.

The slow but steady development of our farming lands and the cultivation of grasses of a succulent nature has already demonstrated what may be done by way of breeding draught horses within the State. This, so far, has been more pronounced in some of the older settled parts of the Eastern districts, but the improvements which are now taking place in the South-West will very soon prove the capabilities of that portion of the State as having the most suitable country for the successful rearing of this class of animal. It is essential for the production of heavy draughts that flat country, inclined to be swampy in parts, should be secured. On land of this class it is possible to grow grasses of a nutritious nature practically all the year round, and thus the food supply necessary for the building up of a large-framed animal can be economically produced. The conditions prevailing, therefore, in the South-West are most favourable in this direction; the mixture of deep loam with clay and limestone country interspersed should supply the herbage required, besides producing oats which are so essential for the thorough development of bone tissue in young growing animals. This is a matter of great importance, and it is well to know that much of our wheaten hay (especially that grown on new land) is deficient in the salts of lime, consequently the chemical elements which are indispensible for the proper sustenance of the body remains unprovided. In laying down pasture for horses, care should be taken to produce grasses of an easily digestible nature, as, unlike cattle, anything of a coarse character is unpalatable and only the fine and smaller-bladed grasses are appreciated. A mixture of the latter with clover forms excellent pasture and can very easily be grown wherever a sufficiency of moisture exists in the soil. The above conditions do not apply to light horses, as, unlike the heavier animal, they prefer a drier and more hilly country, especially of a limestone nature, where a hardy, high-metalled, enduring constitution is more likely to be produced.

FODDER PLANTS.

CHAPTER I.

WEST AUSTRALIAN GRASSES.

The following interesting article was written by Mr. Fred. Turner, F.L.S., F.R.H.S., etc., and appeared in the *Settler's Guide*, published by the Department of Agriculture of this State, and is reproduced for the information of our readers:—

There are about three hundred and sixty species of grass indigenous to Australia, and they are fairly well distributed over the continent. Of the total recorded, one hundred and nineteen species, arranged under forty-nine genera, are found in Western Australia. All these, of course, are not good

forage plants, but amongst the most valuable and nutritious, from a pastoral point of view, the following may be taken as examples:—Six species of *Andropogon*, including the famous "blue," and other excellent grasses. Three of *Anthistiria*, which are commonly known as the "kangaroo," "tall oat" (this yields a good-sized grain), and "landsborough" grasses respectively. Three of *Chloris*, including the "star" or "windmill," and "spider" grasses. Five of *Danthonia*, including the widely and favourably known "wallaby" grass. All the species of this genus have a high reputation as forage for stock. Two of *Diplachne*, one of which is a very good grass for moist situations. Eight of *Eragrostis*, some of which are very good forage grasses, and others are remarkable for their drought-enduring qualities. Eight of *Panicum*, all of which are excellent forage grasses, and include the widely and favourable known "Australian millet," the seeds of which at one time formed an important article of food for the aborigines. Six of *Poa*, which include some good pasture grasses. There are also several species of the following genera:—*Amphibromus* ("marsh brome" grass), *Astrebla* (the famous "Mitchell" grass), *Chrysopogon*, *Cynodon* ("couch" grass), *Deyeuxia* ("bent" grass), *Dichelachne* ("plume" grass), *Eleusine* ("finger" grass), *Eriochloa* ("early spring" grass), *Microlœna* ("meadow rice" grass), *Pappophorum* ("black heads"), *Paspalum* ("water couch"), *Pollinia* ("sugar" grass), *Setaria* ("millet"), *Sporobolus*, and *Sorghum*.

The most undesirable grasses found in Western Australia belong to the genera *Aristida* ("three-awned spear" grass), *Heteropogon* ("spear" grass), *Stipa* ("spear," "corkscrew," or "wire" grass), and *Triodia* ("porcupine" or "spinifex" grass), the latter term, however, is a generic one given to a quite distinct grass, therefore, must not be confounded with it. Whilst young, some of these grasses are really good pasture plants, but when the seeds of *Aristida*, *Heteropogon*, and *Stipa* are ripe, they are irritating and dangerous to the eyes of sheep, often causing blindness. Moreover, the seeds, with their adherent awns, not only become entangled in the wool, which somewhat depreciates its value, but they sometimes enter the vital parts and cause death. Unfortunately, when the grasses that bear these long seed-awns become old, cattle and sheep seldom or never eat them, consequently they grow and produce seed almost undisturbed. The two species of *Triodia* are dreaded on account of their sharp-pointed leaves. Although the total number of undesirable grasses does not amount to more than a dozen, still they are of sufficient importance to make their position felt and somewhat disliked by pastoralists. It would increase the grazing capabilities of those parts of the country where these undesirable grasses very largely predominate in the pastures, if they were occasionally burned off. The operation should be performed when the grasses are in seed, for at this period of their growth both the harsh stems and the objectionable seed awns would be destroyed. In favourable weather new growth is soon made after burning, but it is not advisable to allow animals to graze on this succulent herbage until considerable growth has been made, otherwise it might give them what is commonly termed the scours, or diarrhœa, which sometimes becomes chronic, and, of course, has a weakening effect upon them.

The burning-off of the more valuable pasture grasses is not to be recommended unless they become diseased, or grow into objectionable tussocks of harsh, dry herbage. When good pasture is burned, millions of

valuable grass seeds are destroyed, which are, of course, their only natural means of reproduction. Should the more valuable pasture be accidentally set on fire, sheep should never be turned into the paddocks until the herbage has made considerable growth, though cattle may be turned in without any serious damage being done, for they never eat grasses so close as do sheep. I may here mention the fact that sheep destroy the natural grasses and other herbage in much less time than horses, and the latter much sooner than cattle.

From the above synoptical review of the indigenous grasses of Western Australia, it will be gathered that there is some good material to conserve and cultivate. As a preliminary undertaking towards the conservation of the indigenous grasses and other herbage, reserves should be established in various parts of the country for the purpose of raising seeds to be disseminated in places where the herbage may have been eaten out. Such reserves need not occupy large areas. It is astonishing the quantity of seed that can be harvested from a few acres. It would be a wise thing for the Governments of the Australian colonies to make grass reserves a compulsory undertaking when granting new leases for Crown lands. That such reserves would have a most beneficial effect upon the pastoral areas in this country cannot be gainsaid by thinking persons. In fact, there are already valuable data to work upon. All the railway enclosures throughout the continent are excellent reserves for the preservation of indigenous grasses and other herbage, and the most superficial observer cannot fail to have seen the amount of seed that is matured and distributed on the adjacent land by winds and other agencies. When this seed germinates it cannot fail to enhance the grazing capabilities of the pastures for miles around.

The small paddock system is the best to adopt for grazing large areas in country that is suitable for pasturing sheep, and where the herbage is plentiful. For those areas that have deteriorated so much that animals have a difficulty to eke out an existence on them, it would be a wise thing to rest them for a period, until the better kinds of herbage recuperate. It may not be generally known, but it is almost an invariable fact, that where horses are constantly allowed to graze in pastures where the undesirable "spear" and "three-awned spear" grasses grow, these plants are not nearly so plentiful as they are on those areas from which these animals are excluded; sheep, on the contrary, that are allowed to roam over large areas, eat out the very best grasses and other herbage, and it is not until they become pressed with hunger that they will eat the coarser vegetation.

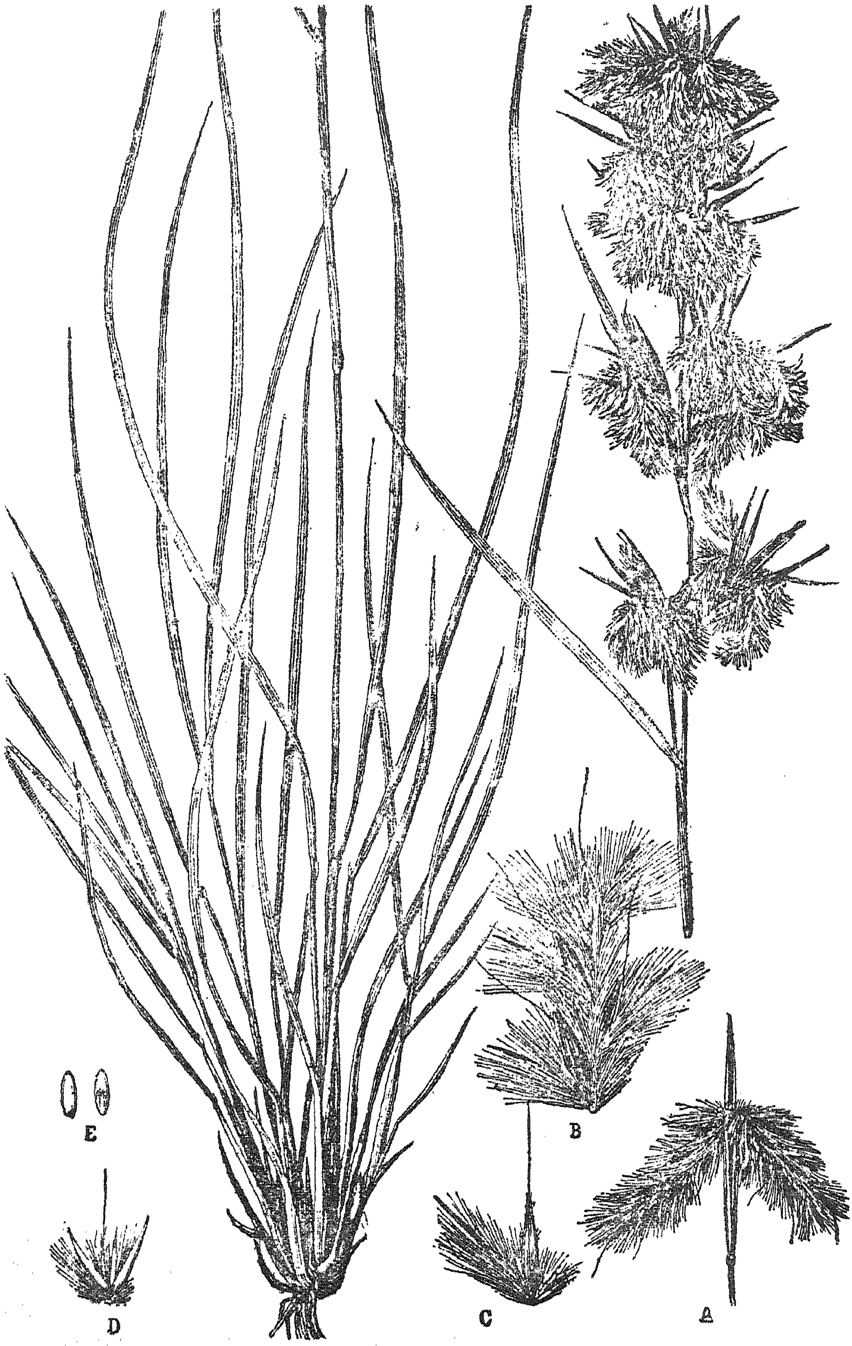
It would depend upon the size of the pastoral holding and the number of sheep that is grazed upon it, as to the size of the paddocks to be adopted, but any larger than 2,000 acres are not to be recommended, smaller areas being preferable. The paddocks should be so arranged that each one should have at least from three to four months' rest in a year. This would give the herbage an opportunity to produce seed, which in time would germinate, and new plants would spring up and cover the ground. Unless the paddocks were in a very bad state before the system was adopted, it is astonishing how quickly some of the herbage would recuperate, drought time, of course, excepted. Another very great advantage to be taken into consideration by adopting the close-paddocking system, is that sheep could be kept, if not near shearing time, a little longer than usual in any paddock which might have a number of noxious plants growing in it, during which time

they would trample most of them down. This would give a better chance for the superior grasses and other herbage to grow when that particular paddock was resting. By adopting the close-paddocking system, it would also be found that fine crops of grass could be cut in some of the paddocks in propitious seasons, which could be made either into hay or ensilage to provide feed for stock during drought time. With the appliances in the shape of labour-saving machinery that are now obtainable at a moderate cost, thousands of tons of fodder could be saved in times of plenty. Whether the grass or other herbage is turned into hay or ensilage it would be advisable to make the stores of fodder some distance apart, so that when it became necessary to artificially feed stock the animals would not be congregated in very large numbers at any particular point. It is easy to imagine, if such a thing did take place, that scores of the weaker ones would be trampled to death. The stacks should, of course, be protected with fencing, in order to keep the animals off during the time that herbage was plentiful in the pastures. Following are the descriptions of those illustrations which accompany this chapter:—

Andropogon bombycinus (R. Br. "Silky heads").—This erect-growing perennial grass, which attains a height of from one and a-half to three feet, is found all over Australia, but principally on the plains in the far interior. It generally grows on the richest of soils, though the writer has occasionally seen it growing on stony ridges. It will withstand a phenomenal amount of dry weather in any situation where its strong, wiry roots can penetrate easily into the earth. Like many other species of the genus *Andropogon*, the base of the stems on being bruised emit a strong aromatic perfume. During the early summer, and sometimes in the autumn months, this grass makes a quantity of succulent, leafy herbage, which stock are fond of. When the grass becomes old, however, the herbage is somewhat harsh, and then it is seldom, or never eaten unless other feed is scarce. The writer has had this species under experimental cultivation, where it proved a very prolific grass, and the herbage lost that harshness, even when it was old, that characterises it when grown on uncultivated land. The seeds usually ripen during November, December, and January, though occasionally in the autumn months.

Anthistiria avenacea (F.V.M. "Tall oat grass").—This perennial grass is found all over Australia, from the coastal districts to the far interior, but principally in the latter portion of the continent. It is only found on the richest of soils, and often in a good season may be seen growing five feet high. It generally grows in tussocks, and produces a quantity of leafy herbage at the base, which, when young, cattle are remarkably fond of and fatten on. After the flower stems have developed, however, they become hard and canelike, and when in this state cattle will leave the plant for more tender herbage. Under ordinary conditions it produces a great amount of seed, which usually ripens during October, November, December, and January, though occasionally in the autumn months. The seeds are large, and in appearance somewhat resemble oats (*Avena sativa*, Linn.).

Anthistiria ciliata (Linn. "Kangaroo" grass).—This is one of the most widely-distributed grasses on the Australian continent, and at one time was supposed to be exclusively Australian. It is, however, found in many countries, including New Guinea. In the tropical parts of Australia it grows more or less all the year round. In the southern portion of the continent it is essentially a summer-growing grass, for it seldom starts into



Andropogon combycinus (R. Br. "Silky heads").

REFERENCE TO PLATE.—A, showing the arrangement of the two spikes and sheathing bract; B, showing the the rhachis (opened out); C, the sessile and pedicellate

Anthistiria ciliata (Linn. "Kangaroo" grass).

REFERENCE TO PLATE.—A, compound cluster of spikelets; B, cluster of male or barren spikelets, and the fertile one, opened out to show how they are arranged; C, fertile spikelet, opened out to show the three glumes and awn. All variously magnified.

Anthistiria avenacea (F.V.M. "Tall oat" grass).

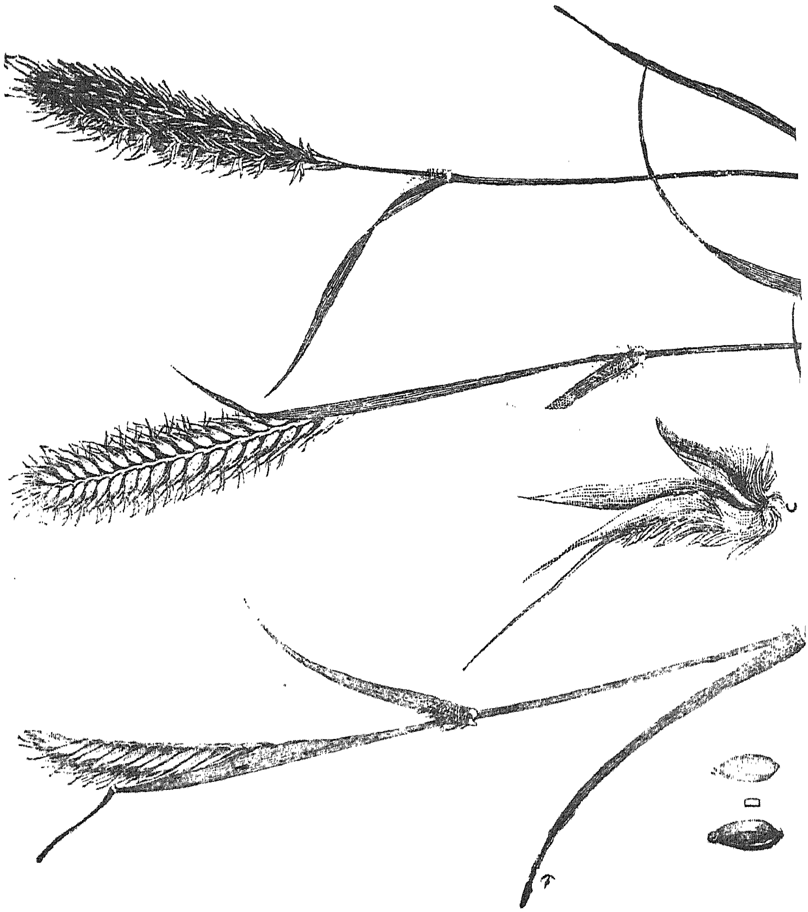
REFERENCE TO PLATE.—A, cluster of male or barren spikelets, and the fertile one, opened out to show how they are arranged; B, fertile spikelet opened out, showing the three glumes and terminal awn; C, male spikelet; D, grain, back and front views. All the details natural size, with the exception of the cluster of spikelets, which is reduced.

growth before October or November. On good soils it is an excellent pasture grass, which herbivora of all descriptions are remarkably fond of and fatten on. Horses may frequently be seen browsing upon the young flower panicles, which they eat with great relish. In the coastal districts it is often cut and made into hay. Although the "kangaroo" grass develops a number of flowering stems, yet it does not perfect a great amount of seed. What there is, however, usually ripens during the summer and autumn months. Mueller and Rummel give the following chemical analysis of this grass during its spring growth:—Albumen, 2·05; gluten, 4·67; starch, 0·69; gum, 1·67; sugar, 3·06 per cent.

Anthistiria membranacea (Lindl. "Landsborough" grass).—An annual species, which is fairly plentiful in many parts of the continent, and is generally found growing on rich soils. It usually grows in small tufts, but in a favourable season the weak stems lengthen out very much, and form an entangled mass over a foot deep. It is essentially a summer growing species, and generally makes most of its growth during the hottest part of the season. The writer has had this grass under experimental cultivation, and raised an excellent crop of herbage in less than three months from seed. It is considered a most nutritious grass, and towards autumn often gets so exceedingly dry and brittle that it breaks up into innumerable pieces, but even then stock of all kinds are said to be so fond of it that they lick the broken stems and leaves from the ground. The "landsborough" grass produces an abundance of seed, which usually ripens during November, December, and January.

Astrebla pectinata (F.V.M.).—This is one of the famous "Mitchell" grasses which some pastoralists and stockmen regard as the best of all native grasses, both for its drought-enduring qualities and for its fattening properties. On rich soils this perennial grass grows into large tussocks, and in ordinary seasons will yield a great amount of rich, succulent herbage, which is much relished by all herbivora. Its thick, wiry roots penetrate the earth to a great depth, which enables the plant to withstand the most protracted drought, and for this reason it is a most valuable stand-by for stock during adverse times. When this grass becomes so dry during a long period of drought that the stems and leaves break to pieces, stock may be seen licking them off the ground, and they seem to fatten on this feed, notwithstanding its uninviting appearance. An experienced drover once told the writer that stock would travel further and keep in better condition when fed on this than on any other grass in Australia. The seeds of this grass when ripe are like small grains of wheat, and at one time they formed an article of food for the aborigines. The seeds usually ripen during November and December, but sometimes in the autumn months.

Danthonia semiannlaris (R. Br. "Wallaby" grass).—A perennial species found over nearly the whole of Australia, and in some situations it is fairly plentiful. It is very variable as regards stature; on rich soils and in a fairly good season it grows three feet high, on those of a poorer description it rarely exceeds a foot in height. In all its varied forms, however, it is one of the most nutritious grasses in Australia, and, unlike most other species of the genus, will grow more or less all the year round. Stock of all descriptions are remarkably fond of the plant and fatten on it. The writer has had this grass under experimental cultivation, and the rich, succulent herbage it produced was much superior to that generally seen in



Astrebla pectinata (F.V.M. "Mitchell" grass).

REFERENCE TO PLATE.—C, floret, open; D, grain, back and front views. All variously magnified.

Astrebla pectinata (F.V.M. "Mitchell" grass).
REFERENCE TO PLATE.—A, spikelet; B, floret, closed.

Anthistiria membranacea (Lindl. "Landsborough" grass).

REFERENCE TO PLATE.—A, compound cluster of spikelets; B, cluster of male or barren spikelets, and the fertile one, opened out to show how they are arranged; C, fertile spikelet, opened out to show the three glumes and terminal awn; D, male spikelet, opened out to show the three glumes; E, grain, back and front views. All variously magnified.

Danthonia semiannularis (R. Br. "Wallaby" grass).

REFERENCE TO PLATE.—A, spikelet; B, floret, closed, showing the three semiannular rings of hair on the back of glume; C, floret, open; D, grain, back and front views. All variously magnified.

pastures. If cut immediately the flower stems appear it makes capital hay. The seeds usually ripen during October, November, and December, but sometimes in the autumn months.

Panicum decompositum (R. Br. "Australian millet".)—This valuable grass is found all over Australia, from the coastal districts to the far interior. In moist places and by the side of watercourses, it sometimes attains a height of four feet; on the plains, however, it rarely exceeds two feet in height. In all its varied forms it yields most valuable herbage, which stock of all kinds are remarkably fond of and fatten on. The writer has had the "Australian millet" under experimental cultivation for several years, and the amount of herbage it yielded in a few months was really astonishing. The hay that was made from it was equal to three tons per acre. The seeds usually ripen during the summer and autumn months. At one time the aborigines used to collect the seeds in large quantities, grind them between stones, make the flower into cakes, bake them, and use them as an article of food.

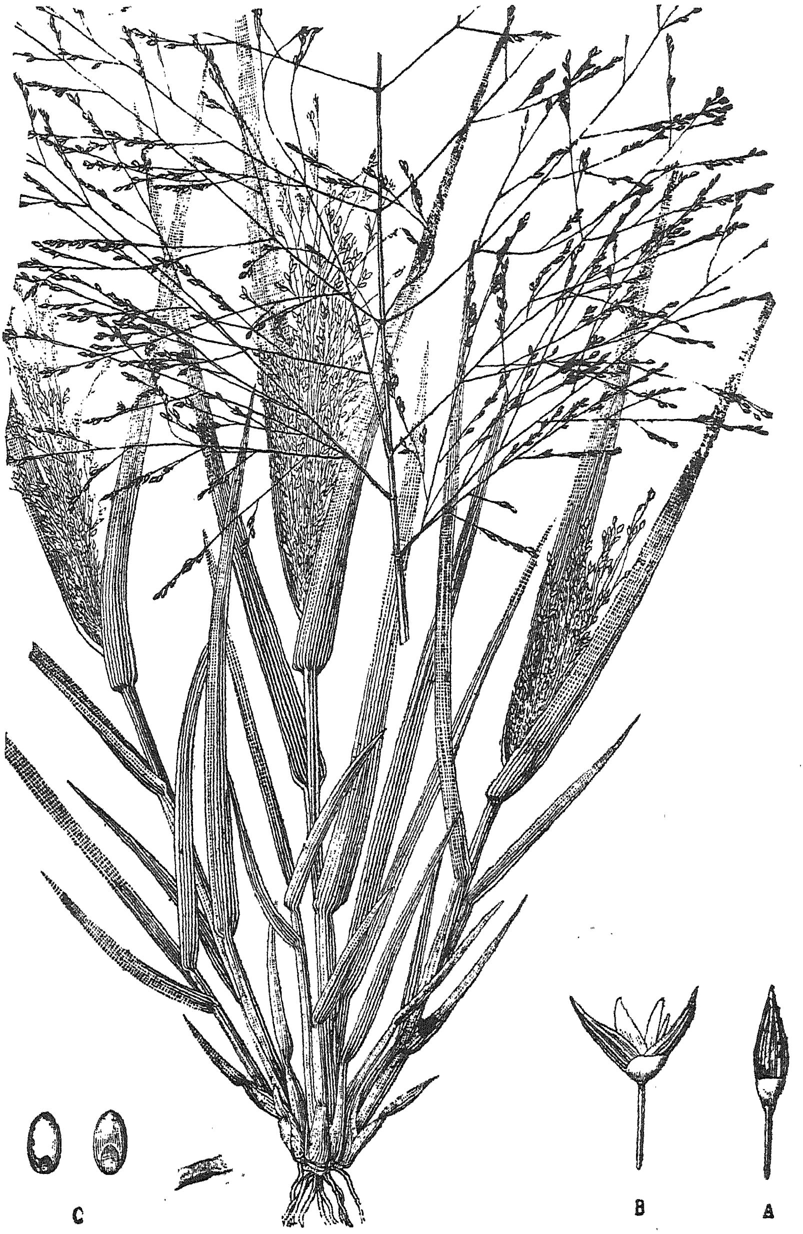
Panicum gracile (R. Br. "Slender panick grass".)—This perennial species is fairly well distributed over the continent. It is rather variable in habit, but it all its varied forms it is an excellent pasture-grass which stock of all descriptions are remarkably fond of and fatten on. In rich pastures it yields a very superior herbage. On poor soils and in very dry situations its leaves are narrow, and in dry seasons its stems are somewhat harsh; still when in this condition cattle seem fond of it. The seeds usually ripen during October, November, and December.

Pollinia fulva (Benth. "Sugar grass".)—This perennial species is easily recognised when in flower amongst other grasses by its rich brown, silky spikes. It is generally found growing on the richest of soils, and often on deep alluvial flats, bordering rivers and creeks. It is a superior pasture grass, and is much praised by stockowners, who have given it the name of "sugar grass," on account of the sweetness of its stems and foliage. During the summer months, in an ordinary season, it produces a great bulk of rich, succulent herbage, which is much relished by all herbivora. It makes capital hay. The seeds usually ripen in November and December.

CHAPTER II.

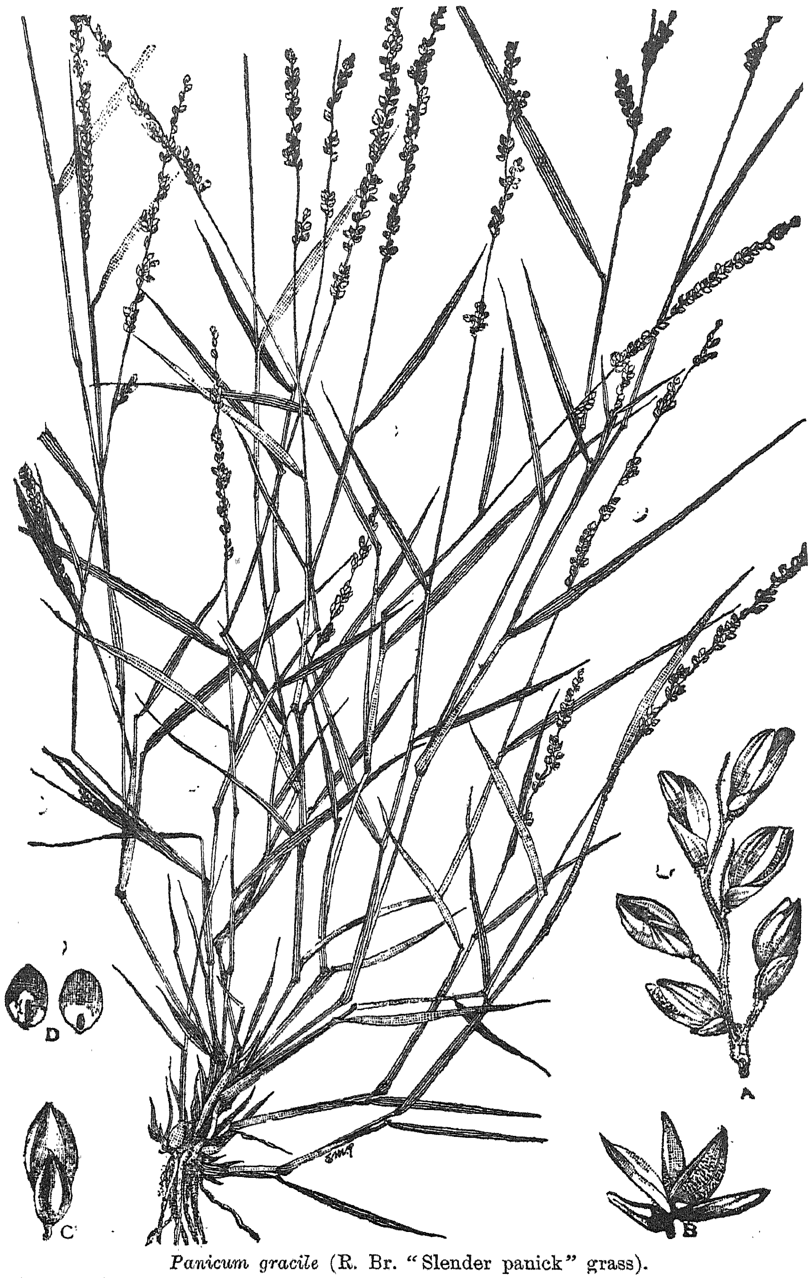
WEST AUSTRALIAN SALT-BUSHES.

Amongst the native forage plants of Australia (non-grasses) the most numerous and valuable belong to the natural order *Chenopodiaceæ (Salsolaceæ)*, numbering as they do for all Australia about one hundred and twelve species, arranged under fifteen genera, eight of which are endemic. Some are found on the littoral sands, whilst others extend to the arid plains of the interior, and are remarkable for their drought-enduring properties. Of this total, 63, species arranged under fourteen genera, are found in Western Australia. Amongst the best are fifteen species of *Atriplex*, some of which attain the dimensions of good-sized shrubs, whilst others are dwarf herbaceous perennials. They are fairly well distributed over the colony, grow on a great variety of soils, will live through the driest season, and most of them are good forage plants. Nine species of *Rhagodia* have been recorded from different parts of the colony, most of these growing into good-sized



Panicum decompositum (R. Br. "Australian millet").

REFERENCE TO PLATE.—A, showing the relative size of the outer glume to the spikelet; B, spikelet opened out, showing the position of the four glumes and two paleas; C, grain, back and front views. All variously magnified.



Panicum gracile (R. Br. "Slender panick" grass).

REFERENCE TO PLATE.—A, showing the arrangement of the spikelets on the rhachis; B, spikelet opened out, showing the four glumes and palea; C, showing the relative size of the outer glume on the spikelet; D, grain, back and front views. All variously magnified.

Pollinia fulva (Benth. "Sugar" grass).

REFERENCE TO PLATE.—A, showing the arrangement of the spikelets on the rhachis, B, sessile and pedicellate spikelet; C, sessile spikelet, showing the arrangement of the glumes and terminal awn; D, grain. All variously magnified.

shrubs, but a few being of prostrate habit. They withstand a phenomenal amount of dry weather, and have a good reputation as forage for stock. The next large genus is that of *Kochia*, which includes ten species, all of which are remarkable for their drought-enduring properties, but on the whole are not considered such valuable forage plants as the species arranged under the two preceding genera. Many of the remaining species are good forage plants whilst young, though exception might sometimes be taken to certain of the following. During protracted droughts balls of cotton-like substance form on *Kochia villosa*, Lindl., *Enchylæna tomentosa*, R. Br., and a few other species of the order. It is generally supposed that this adventitious growth is caused by some insect. Speaking generally, however, only one bush in a thousand is subject to this cottony "gall," except during very protracted droughts, when the "galls" are more plentiful. The fulvous tomentum on some species of *Sclerolæna*, and the woolly covering of the fruits of some species of *Chenolea*, have been known to kill sheep when they have partaken too freely of this indigestible stuff along with other parts of the plants. Only two or three species of *Anisacantha* are found in Western Australia, and these have not nearly such long spines on their fruits as those that are peculiar to the eastern portion of the continent have, and which cause so much trouble to the salivary glands of sheep and other small herbivora if they eat too greedily of these plants when the fruits are near maturity.

Most Australian pastoralists know from long experience that a large number of the salt-bush family are exceedingly tenacious of life, in fact, the drier the season the more luxuriant many of them grow, provided that they are not persistently eaten down. Moreover, there are abundant proofs that when sheep are pastured on country where plenty of salinous plants are growing amongst the natural grasses, distoma and other allied diseases are almost unknown. It has been said that if horses, which are subject to swamp cancer when on the low coast lands, are turned into dry pasture where salinous plants are growing plentifully, they soon lose this disease. Where the salt-bush grows plentifully on pastoral areas in the eastern division of the continent, stock thrive during the driest of seasons. But in those parts of the country where the salt-bush has disappeared through over-stocking and other causes, sheep and cattle often die in large numbers of starvation when the grasses and the more tender herbage have died out through drought. To provide against such a contingency in the future it would well repay pastoralists to redisseminate salt-bush on those areas from which it has disappeared, and systematically conserve it where it is already growing. Fenced-in salt-bush reserves should also be established on every pastoral holding in the country where the conditions for the growth of the plant are favourable. Most kinds of salt-bush will withstand a few degrees of frost with impunity. Reserves could be made at very little expense, and the best way to lay them out so as to be of the greatest possible benefit to stock during dry times, when other feed is scarce, is as follows:—Each one should be made from half a mile to a mile in length, about two chains in width, and from three to six miles apart, according to the size of the pastoral holding. This plan is recommended for obvious reasons. It is easy to imagine, if these reserves were laid out near each other, that the hungry animals would congregate in large numbers at some particular point, and that scores of the weaker ones would be trampled to death. It is really astonishing the amount of excellent forage that can be cut, if done in a systematic way, from a few acres of established salt-bush, even in the driest of seasons. The young succulent shoots and leaves of many species of

Atriplex and *Rhagodia* make fairly good table vegetables if cooked and served in the ordinary way. On those pastoral holdings where it is difficult

Atriplex cinerea, Poir. ("Grey Salt-bush").

and often impossible to grow the common garden vegetables during the hot summer months, a few of the best kinds of salt-bush could easily be cultivated and used as a substitute.

Propagation.—All the salt-bushes can be raised from seed, and many of them can be multiplied by cuttings. The latter should be made of the half-ripened wood, cut into lengths of about one foot or fifteen inches, and put into the ground in the ordinary way. The best time to do this is during the early spring or early autumn months, when the soil is sufficiently moist to keep the cuttings from wilting until root action begins. As soon as the cuttings have taken root they will withstand any amount of dry weather. Speaking generally, most species of the genera *Rhagodia* and *Atriplex*, also several species of *Chenopodium* and *Kochia*, can be readily multiplied by cuttings. The seeds of the different species of *Atriplex*, when mature and dry, are very light, and it will take about twenty thousand of them to a pound. The best time to sow salt-bush seed is in early spring or early autumn, when the ground is moist, but not wet. Under such conditions the seed will germinate quickly, and the plants grow rapidly. The seeds should be sown in patches (about half a dozen seeds together), at distances of about ten yards for the tall-growing kinds, and three yards for the dwarf-growing sorts, and from half an inch to an inch deep. If the soil is of a strong, tenacious character, the seeds should be covered with some light, decayed vegetable matter, which will offer no impediment to the young plants coming out of the soil. The seed can be put in with the aid of a light hoe. It is not necessary to plough the land preparatory to sowing the seed, as salt-bush spreads rapidly on most kinds of soil once the plants become established thereon, if protected against cattle and sheep for a time. It should be mentioned that to sow the seed broadcast on the land is both an unsatisfactory and expensive way of propagating salt-bush. Most of the seeds being very light, it is a difficult matter to cover them when sown in this way, and if left on the surface they would be blown away by the wind. Following are the descriptions of those illustrations which accompany this chapter:—

Atriplex cinerea, Poir. ("Grey salt-bush").—A branching shrub, which often attains a height of several feet, and is covered all over with a white or grey scaly tomentum. Its leaves are oblong, or lanceolate, and from one inch to two or more inches in length. The plant is peculiar to the saline sands on the eastern, southern, and western seaboards of the continent, and in some places is fairly plentiful. The succulent stems and leaves make excellent forage for cattle, which eat it with great avidity, and they seem to thrive well on this herbage. This salt-bush is easily propagated both by seeds and cuttings. The latter should be made of the half-ripened wood and inserted in the soil in the ordinary way. The seeds can be sown where the plants are intended to grow permanently, or in prepared beds, and when the seedlings are large enough to handle they can be transplanted to their permanent positions.

Atriplex halimoides, Lindl. ("Salt-bush").—This is a procumbent or diffuse undershrub, often attaining a height of one foot or more. The whole plant has a glaucous or whitish appearance. Its leaves are variable, but mostly ovate-lanceolate or rhomboidal, and from one and a quarter to two inches long. This salt-bush is peculiar to the inland plains, and will withstand a phenomenal amount of dry weather. It is a capital forage plant both for sheep and cattle, and they seem to thrive well on it, the

former particularly so. Under ordinary circumstances the plant produces an abundance of seed, which germinates readily when sown in the ordinary way.

Atriplex halimoides, Lindl. ("Halimus-like Salt-bush").
FIG. I.—Enlarged drawing of the fruit.

(To be continued.)

THE INSECT PESTS AMENDMENT ACT, 1898.

ORDER IN COUNCIL.

At the Executive Council Chamber, at Perth, this 6th day of December, 1905.

Present:

His Excellency the Governor.

The Honourables—

The Colonial Treasurer,	The Minister for Commerce,
The Colonial Secretary,	The Minister for Lands,

M. L. Moss, M.L.C.

WHEREAS by "The Insect Pests Amendment Act, 1898," it is provided that the Governor by Order in Council gazetted may from time to time make such regulations as he may deem necessary for any purpose for which regulations are contemplated by the said Act, or which he deems necessary in order to give full effect to the said Act: AND WHEREAS it is deemed necessary to regulate the conditions under which fruit, fruit trees, plants, scions, cuttings, or bulbs may be imported into this State: NOW THEREFORE I, the said Governor, with the advice of Executive Council, do hereby order as follows:—

No passenger, agent, or other person shall introduce into Western Australia, at any port or place, or be concerned in the introduction of any fruit, fruit trees, plants, scions, cuttings, or bulbs with the personal effects of such passenger, or in any package or parcel, or otherwise howsoever, except under the direction and with the approval of an inspector or other authorised person under "The Insect Pests Amendment Act, 1898."

This regulation does not apply to the introduction of fruit, fruit trees, plants, etc., as cargo, and shall be construed as an additional regulation to the regulations published in the *Government Gazette* on the first day of August, 1902.

ARTHUR H. WILLIAMS,
Clerk of the Executive Council.

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A.N.A. EXHIBITION IN MELBOURNE.

Under the auspices of the Australian Natives' Association, an exhibition is being held at the Exhibition building in Melbourne. The opening is fixed to take place on 27th January, in connection with the annual celebrations. All the other States are being represented. A large portion of the building is being filled with interstate exhibits.

Mr. P. Wicken, of the Department of Agriculture, has been appointed to represent this State, and he left for Melbourne on the 9th inst. with the following exhibits, which have been supplied by various departments :—

CATALOGUE OF EXHIBITS.

AGRICULTURAL.

A collection of 150 kinds of grain, comprising Wheat, Oats, Barley, Rye, Maize, and Peas. Also sheaves of Wheaten and Oaten Hay, Cotton, Hops, Maize, Peas, etc. The undermentioned varieties, as well as many others, are included :—

Varieties of Wheat.

Farrer's 62A	Australian Crossbred 167	Red Fife
Queen's Jubilee	Fife Essex	Nonpariel
White Lammas	White Tuscan	Allora Spring
No. 77	Galland's Hybrid	Blue Stem
Alpha	Doon	Medick
Farrer's 43C	Minnesota	Garton's "New Era"
Farrer's 113A	Belatourka	Brodie's Prolific
Plover	Russian Summer Bearded	Tardent's Blue
Blue Stem	Toby's Luck	Champlan
Silver King	Lambrigg Talavera	Marshall's No. 3
Rangit	Australian King	Rerraf
Withney Fife	Black Speltz	Field Marshal
Lucky Talavera	White Speltz	Noe
Yellow Blue Stem	Medeah	Dattel's Hybird
Mold's Red	Red Lammas	And others.

Varieties of Oats.

Early Ripe	Algerian	Garton's C
No. 23	Joanette	Black Winter
Siberian	Garton's A	Grey Winter
Huskless	Garton's B	

Varieties of Barley.

Hofbran	Red California	Garton's A
Garton's Zero	Chevalier	Garton's B
Gambrinus		

Varieties of Maize.

Abercrombie	Austin's Colossial	Virginia Ensilage
Riley's Favourite	White Dawn	Old's Mammoth Flint
Reid's Yellow Dent	Gold Cap	Holt's Strawberry
Pride of the North	Boone County	White Cap Dent
Saunders' Improved	Mosby Prolific	No. 1 Red
Hickory King	Iowa Silver Mine	Early Yellow
Old Gold	Eureka	

VARIETIES OF RYE.

Giant	Summer Saxon

VARIETIES OF—

LINSEED ...	... Tunisian	HOPS ...	... Oregon
RICE ...	... Egyptian	MILLET ...	... Siberian
PEAS ...	... Dwarf Sugar		

All the above exhibits are grown at the State Experimental plots, situated at Hamel, on the S.W. Railway; at the Chapman Experimental Farm, in the Geraldton District; or at the Narrogin Experimental Farm, situated on the Great Southern Railway. At the two latter of these places students are received for a course of farm work.

FORESTRY.

Panels of each of the Commercial Woods of Western Australia, with leaves and flowers of trees carved on each panel :—

Jarrah	Tuart	York Gum
Karri	Sandalwood	Wandoo
Blackbutt	Jamwood	Sheoak
Banksia	Morrell	Red Gum
Native Pear		

Some splendid specimens of carved Jarrah Furniture, showing the fineness to which Jarrah timber can be worked :—

Jarrah Arm Chair.

Pair Ecclesiastical Chairs.

Jarrah Coffer or box, with carved panels on all sides.

Inlaid table showing the Commercial Timbers of W.A., design "Maltese Cross."

Jarrah Cup, carved from old pile 50 years in water.

Wooden Book inlaid with W.A. timbers.

Carved Karri Panel—"Dolphin and Neptune's Fork."

Carved Jarrah Panel—Allegorical figure "Defiance."

Also Fencing Posts, Sleepers, and sections of timber which have been exposed to the weather for a number of years.

EDUCATIONAL.

Stand showing Drawings and Work performed by Pupils attending the Manual Training Classes in the State Schools.

GOLDFIELDS WATER SUPPLY.

Section of 30-inch Main used to convey the water from Mundaring to Kalgoorlie, 350 miles.

Section of Locking Bar used in construction of Pipes.

Series of Photographs showing scenes in construction of Water Main, Pumping Stations *en route*, the water at Mundaring Weir, and delivery of same at Kalgoorlie.

MINING.

One hundred and fifty specimens of Ores found in Western Australia, comprising:—

Gold Ores	Aluminium Ores	Lithia Compounds
Copper Ores	Zinc Ores	Silicas
Tin Ores	Lead Ores	Silicates
Tungsten Ores	Antimony Ores	Tantalates
Iron Ores	Lime Compounds	Phosphates
Nickel Ores	Magnesia Compounds	Carbon Compounds
Cobalt Ores	Baryta Compounds	

COLLECTION OF NATIVE WILD FLOWERS.

FLORA AND FAUNA.

Various Exhibits of Interest.

RELICS AND CURIOS.

Wooden Bicycle, ridden from Perth to Kalgoorlie in the early days of the Gold rush.

Relics of the Wreck of the Dutch vessel "Zeewyk," 1727.

Aboriginal Curios.

Statistical Sign, showing the progress made by Western Australia since the granting of Responsible Government.

A large number of Photographs of the State, illustrating the

Agricultural Industry	Mining Industry	Pearling Industry
Pastoral Industry	Timber Industry	

Also showing Locomotives and Corridor Cars in use, Public Buildings in Perth and on the Goldfields, Aboriginals, and other Items of Interest.

A quantity of Literature dealing with Land Settlement and General Information about the State is available for distribution, and all further information about the State and its resources can be obtained from Mr. P. Wicken, the Officer in charge of the Exhibits.

GARDEN NOTES FOR FEBRUARY.

By PERCY G. WICKEN.

February is about the hottest month in the year, and, owing to the length of time we have been without rain, the ground is so dry that there are very few vegetables growing in the garden. The principal operations for the month should consist in keeping the ground well stirred between the growing plants so as to conserve as much moisture as possible for the use of the plant, and in preparing land ready for planting as soon as the first rain falls. All land for garden purposes should be dug as deeply as possible, but the sour subsoil need not be brought to the surface, it should only be broken up and left beneath the surface. It will then gradually sweeten owing to the action of the air and water, and will allow the roots of the plant to penetrate deeply into the soil and thereby enable them to withstand a period of drought. When the soil is broken up it should be well mixed

with well-rotted stable manure, or, if this is not obtainable, bone-dust may be used instead, and should be well mixed with the soil. The more soluble fertilisers should be sown at the time of planting the seed, or as a top dressing when the plants have made some growth.

No plant should be allowed to run to seed unless the seed is required for use or sale. The process of forming seed takes a quantity of the fertilising ingredients out of the soil, besides which, if the seeds are allowed to ripen and get scattered all over the ground, they come up next year among another crop and have to be hoed out. As soon as a plant is of no further use it should be cut down and thrown on the compost heap or dug into the ground.

In favourable situations, where water is obtainable in sufficient quantities to permit of watering the vegetable garden, full use should be made of this opportunity, as it is at this season of the year that vegetables are scarce and consequently generally command good prices.

The noxious weed, stinkwort, will become conspicuous this month owing to its green appearance when everything else is dried up. This weed, unless kept in check, is likely to become a serious trouble to settlers, and should be destroyed wherever it can be found before it has an opportunity of maturing its seeds.

Beans.—Wherever there is sufficient moisture to germinate the seed, further sowings may be made so as to keep up a supply.

Beans (Madagascar).—The vines should be now well loaded with beans. They should be picked as young as possible, before they become stringy.

Beans (Lima).—Should now be in full bearing. Shell and cook the same as green peas, and if you have more than enough for present requirements dry them and keep them until the winter.

Beet (Red.)—A supply of seed may be sown if they can be watered. Beets require a rich, well-drained soil, and for preference one that has been manured for the previous crop. They should be sown in drills, 18 inches apart, and thinned out to about nine inches apart in the drill, or they can be raised in seed beds and planted out with the first rain.

Beet (Silver).—Sow a little seed in a seed-box so as to have forward plants for the first rain.

Brussel Sprouts.—These miniature cabbages should be more largely grown; they will do well in all the cooler districts. Sow a little seed in a bed ready to plant out later on.

Cabbage.—Sow seed either in a seed-bed or boxes so as to have a supply of plants to put out as early in the season as possible. The soil for the seed-boxes should consist of about half fine soil and half well-rotted stable manure, well mixed together and put through a sieve if posible before sowing the seed. As the young plants come up they should be thinned out so as to allow about a square inch to each plant, and then good healthy plants are obtained.

Carrots.—Prepare land by digging as deep as practicable and working it up fine. Land manured the previous season is preferable to using fresh manure. Carrot seeds germinate slowly, and the rows or seed-beds must be kept free from weeds.

Cauliflower.—Prepare seed-beds same as for cabbages, and sow a quantity of seed so as to abtain early seedlings for transplanting.

Melons and Pumpkins.—Select some of the best of each kind to keep for seed, mark them, and allow them to become thoroughly ripe before cutting.

Sweet Potatoes.—Some of the early sown ones should be fit for digging. Keep the others free from weeds and the ground well stirred.

Potatoes.—Prepare land by ploughing deeply, and give it a good dressing of manure so as to be ready to sow as soon as the ground becomes moist enough.

Tomatoes have been very plentiful this season, but contain a great deal of disease. All diseased fruit should be destroyed either by boiling or burning, so as to prevent the spread of the disease.

Turnips.—In localities where there is sufficient moisture in the soil both white and Swede turnips may be sown so as to obtain an early crop. In drier districts a few plants may be raised in a seed-box to transplant on the first opportunity.

Farm.—Harvesting operations now being completed, the principal work on the farm will be chaff-cutting and winnowing. The practice of cutting the string bands up with the chaff—which was prevalent some time ago—has been largely discontinued, but a small quantity of chaff with the string cut up still comes into the market. Settlers should discontinue this practice; it does not pay; the chaff commands a lower price, as it is injurious to the horses consuming it. It is very little trouble to cut the bands off when feeding the chaff cutter, and the string is always useful on the farm.

Where the ground is soft enough ploughing operations should be commenced as soon as possible, as the sowing season is so short, but unless the ploughs can do good work and plough an even depth it will be better to leave it over until the rain softens the ground. When land is scratched over and ploughed one inch deep in some places and three or four in others the crop cannot give satisfactory returns. Half the area sown and worked thoroughly will pay better than the larger area badly worked.

Firebreaks should be ploughed wherever possible so as to check any fires which may break out. Although a few plough furrows round a grass paddock may not altogether check a bush fire, they are a great help to those who are attempting to beat out the flames, and often enable them to check the flames when they would not be otherwise enabled to do so.

LOCAL MARKETS' REPORTS.

MESSRS. H. J. WIGMORE & CO.'S REPORT.

H. J. Wigmore & Co., of Fremantle, Kalgoorlie, and Northam, report as follows, in connection with their daily auction sales of chaff and grain at Perth and Fremantle Railway Yards, for month ending 8th inst.:—

Chaff.—We have no material alteration to report in the market during the past month, and it is extraordinary that prices should have remained so firm and without fluctuation for this time of the year. Closing rates are identical with those reported in our last, viz.:—Prime green wheaten, £4 10s. to £4 12s. 6d.; f.a.q. wheaten, £4 5s. to £4 7s. 6d.; good medium wheaten, £4 to £4 2s. 6d.; prime oaten, £4 12s. 6d.; f.a.q. oaten, £4 2s. 6d. to £4 7s. 6d.; medium and inferior grades, according to quality and condition. Contrary to expectations, supplies have been exceedingly regular after the holidays, and have not been rushed in, as was generally anticipated. There is now, however, a tendency on the part of farmers to forward in more freely, and if this continues and increases there is not the slightest doubt, in our opinion, that prices will ease. It will be a distinct advantage to the trade generally when the official report is in as to the quantity of hay harvested and available for 1906. The greater portion of the consignments have arrived from the following centres during the month:—Meckering, Seabrook, Moora, Waeel, Koogan, Northam, York, Greenhills, Goomalling, and Newcastle. We have placed considerable quantities on rails, Northam, for the Goldfields, and are still in a position to do large private business with these centres.

Wheat.—This commodity advanced during the month, as high as 4s. 1d. being realised for prime milling, but latterly, owing to the somewhat heavy consignments coming forward, the market has experienced a downward tendency, and to-day 3s. 10d. was the highest price obtainable for three trucks sold at auction in Perth. Should these heavy supplies continue, we anticipate prices receding still further. We have made considerable private sales at prices ranging from 3s. 5d. to 3s. 7d., on rails at country centres. The tendency of the Eastern wheat markets is also to ease.

Straw is worth £2 12s. 6d. There is not a heavy demand, however.

Flour.—We have to report very heavy sales during the past week of both Thomas' Adelaide and Northam "Standard." Contracts are now being made freely at £7 15s. upwards, f.o.b., Adelaide, and at £8 10s. on rails, Northam. We cordially invite bakers requiring either of these well-known brands to communicate with us at once. For Northam "Standard," immediate delivery, we can quote £8 5s. per ton, on rails, Northam

Bran and Pollard on spot at the present moment are worth £6 and £7 respectively. Heavy purchases from the East, however, will arrive this week, which have been purchased at a considerably cheaper, equivalent f.o.b. Melbourne quotes 9½d. bran and 10¼d. pollard, prompt shipment; and Adelaide, also prompt, 10½d. and 11½d. respectively. Sydney is quoting bran 8¾d. for immediate shipment, and pollard 11d. Very heavy contracts for both bran and pollard have been made from Adelaide during the month.

Oats.—On spot local Algerians have been sold at up to 2s. 7d., whilst we have sold privately at 2s. 3d. on rails country centres. Victorian Algerians have risen and are now quoted at 1s. 9d., f.o.b., for good feeds, as against 1s. 8½d. last week. Heavy sales have been made by us at the lower figure. Apparently this market is going firmer.

Potatoes.—We wish to bring under the notice of potato-growers that we are in an especially good position to handle this tuber on their account, as we now have our office at Kalgoorlie, and will be pleased to receive advices from those holding.

THE PERTH FRUIT AND PRODUCE EXCHANGE REPGRT.

The Perth Fruit and Produce Exchange, 387 Murray Street, Perth, report that splendid demand exists for all kinds of fruit, and although prices have fluctuated somewhat, yet growers have been realising excellent returns.

The grading of products requires very close attention on the part of packers, and the force of this will appeal to the producer who, by carefulness in this respect, establishes a name in the saleroom for prime consignments, and thus creates keen competition for his fruit, etc.

Potatoes remain firm, and prices quoted hereunder for prime lines, but diseased parcels, which are fairly numerous, are hard to quit.

Fruit.—Prices at date are as under: Oranges, 13s. to 18s.; lemons, 6s. to 10s.; cherries, up to 10s.; strawberries, 5s. to 9s.; plums, 5s. 6d. to 6s.; Japanese plums, 16s. 6d.; figs, to 9s. for prime lots; apricots, 12s. 6d. to 20s., quarter cases, 6s. to 9s.; peaches, 15s. to 21s.; apples, 11s. 6d. to 15s., small cases, 5s. 6d. to 6s.; pears, 7s. to 10s.; grapes, 5s. to 9s.; water melons, 3s. to 12s.; rock melons, 3s. to 7s.; tomatoes, 2s. to 7s.

Potatoes, 8s. to 11s. 6d. per cwt.; onions, 5s. to 6s.; peas, 2½d. to 4d.; French beans, 3¼d. to 4d.; rhubarb, to 2d.

Eggs, prime local, up to 1s. 7d.; country, 1s. to 1s. 3d.

Ducks, 6s. to 6s. 6d.; fowls, 5s. 6d.

WOOL SALES.

London, January 11.

Wool.—The closing of the Antwerp wool sales showed a better disposition to buy out. Of 2,480 bales of La Plata wool offered, 1,095 were sold.

CLOSING SERIES, 1905.

The sixth series of colonial wool sales, which opened on November 28, closed on December 9. The available quantity of Australasian Cape wools was estimated at 107,000 bales, but this was somewhat under the mark, as no less than 109,824 bales were catalogued, though allowing for lots twice offered, we believe the actual quantity of first-hand wools did not exceed 108,000 bales, of which the large proportion of 82,334 bales were new clip Australasian; of these 107,000 bales were sold, 51,000 for home consumption, 54,500 to the continent and 1,500 bales to America, leaving 1,000 bales to be carried forward to next series. In some quarters, however, the available total is put at 109,000 bales and the quantity carried forward as 2,000 bales; all these figures, however, must be looked upon as approximate except in respect to quantities actually appearing in catalogue.

The attendance and competition were good throughout, and values with the exception of some of the West Australian clips (which made very high prices in September, but on working were found to waste much more than buyers had reckoned on) ruled at fully September rates to 5 per cent. decline, any weakness in merinos being chiefly noticeable in the best class of scoured, except where exceptionally fine in the hair, and in wasty earthy greasies.

The selection of crossbreds was limited, and consisted chiefly of slipe wools and a few parcels of greasies, the better lots of which in some cases realised a slight advance, though the medium and low grades, on the other hand, barely mantained September rates.

The quantity of Western Victorian catalogued was very limited, and this class of wool being in short supply good prices were realised, the fleece of the "Plains" brand making on average 1s. $3\frac{1}{8}$d., and "Trawalla" 1s. $3\frac{3}{8}$d. per lb.

The quality of the New South Wales and Riverina wools offered was considered fully up to expectations. They were perhaps not quite so fine as last year, but bright in appearance, well grown, sounder, and generally far more free from burr.

With respect to the result of the January sales, we do not think that any material decline should take place, although the arrivals of wools purchased in Australasia by dealers and consumers may exercise some influence; this will, however, apply more especially to the March series. Wool, however, is indisputably very scarce at the moment, and there seems every reason to believe that the requirements of the trade during next year will be equal to the probable supply if trade remains as good as of late.

The list of total imports of wool of the season into Europe and North America, as supplied by Messrs. Helmuth, Schwartze, and Co., shows that the deficiency last season was still 453,000 bales as compared with 1895, and the enormous shortage during the last ten years fully justifies the present position of the market.

IMPORTS AND EXPORTS.

ELEVEN MONTHS' FIGURES.

The value of imports and exports and the total trade of the various ports of Western Australia for the eleven months ended November 30 are given in the December Statistical Abstract as follows:—

	Imports.	Exports.	Total Trade.
	£	£	£
Fremantle	3,060,800	6,387,679	11,926,480
Perth	1,568,902		
Albany	142,191	488,576	570,367
Geraldton	114,770	108,262	224,038
Bunbury	52,822	448,391	485213
Broome	35,648	100,156	135,804
Cossack	3,163	45,966	49,129
Vasse and Hamelin	3,655	34,562	38,217
Carnarvon	7,189	82,479	89,668
Port Hedland	8,060	51,443	60,503
Derby	3,078	42,708	45,786
Onslow	5,087	66,695	71,722
Esperance	13,065	...	13,065
Eucla	266	...	266
Wyndham	3,708	...	3,708
Total	5,938,443	7,791,917	13,724,360

Exports to places beyond the Commonwealth only.

THE CLIMATE OF WESTERN AUSTRALIA DURING DECEMBER, 1905.

On the whole, this month may be characterised as one of the hottest Decembers ever experienced in the State. The temperature was about normal on the coast from Geraldton to Wyndham, and also from Albany to Eyre, but elsewhere it was considerably in excess of the average for previous years. At Perth the mean of the daily maxima was the greatest on record, and the Observatory records show ten days on which the temperature reached 90°—the greatest previous number being seven. At Marble Bar—the hottest station in the State, and probably in Australia—the mean maxima was 109°·0, and the highest reading 115°·9. The highest individual reading was 118°·0, at Winning Pool.

The weather was also unusually cloudy and sultry, with a great number of electrical disturbances, and on the 24th the somewhat rare occurrence (in December) of a days steady warm monsoonal rain was experience in S.W. districts.

It may be interesting to compare the Perth temperature with that of a few other places in the State. Of the two sets of readings in Perth, it will be better to take those at the Botanical Gardens as representing more closely what would be generally understood as the Perth temperature. Considering first the mean daily maximum, we find that Fremantle was 8°·7 cooler, Geraldton 6°·4, Rottnest 11°·0, Mandurah 2°·9, Bunbury 6°·2, Busselton 3°·9, C. Naturaliste 12°·6, Bridgetown 3°·1, C. Leeuwin 13°·6, Albany 14°·3, and Esperance 11°·4 On the other hand, Guildford was 0°·9 hotter, York 3°·8, Northam 5°·2, Southern Cross 9°·8, Coolgardie 6°·7, Kalgoorlie 7°·5, Cue 13°·5, and Marble Bar 22°·0.

Next, taking the night minimum, we find that Geraldton was 1°·4 cooler, Fremantle 0°·3, Rottnest 0°·2, Mandurah 3°·6, Bunbury 5°·2, Busselton 10°·4, Cape Naturaliste 5°·8, Bridgetown 11°·2, Cape Leeuwin 2°·6, Albany 9°·0, and Esperance 5°·7. The coolest reporting station at night was Mt. Barker, where the mean minimum was only 49°·8, or 14°·8 lower than at Perth. Going inland to the Eastward, it was cooler than Perth at all stations up to Kalgoorlie, where it was practically the same. At Cue it was 7°·3 hotter, and at Marble Bar 15°·4.

With respect to the day temperature along the coast, it must be remembered that the thermometer at Fremantle, Cape Naturaliste, and Cape Leeuwin are exposed on the very edge of the cliff, while those at Mandurah, Bunbury, and Busselton are about half a mile inland, and although no direct experiments have been made, it is believed that the temperature varies rapidly quite close to the coastline.

Pressure was almost everywhere slightly in excess of the average for previous years.

The rainfall, as might be expected from the general character of the weather, was irregular. On the whole, it was lighter than usual throughout the Northern half of the state, and heavier in the Southern, the Kalgoorlie goldfields being especially favoured.

The Climate of Western Australia during December, 1905.

	Locality.	Barometer (corrected and reduced to sea-level). Mean of 9 a.m. and 3 p.m.	Average for previous years.	Highest for Month.	Lowest for Month.	Shade Temperatures. December, 1905. Mean Max.	Mean Min.	Mean of Month.	Highest Max.	Lowest Min.	* Average for previous Years. Mean Max.	Mean Min.	Highest ever recorded.	Lowest ever recorded.	Rainfall. Points (100 to inch) in Month.	Wet Days.	Total Points since Jan. 1.
North-West and North Coast:	Wyndham	...	29·802	...	...	...	...	...	...	...	98·2	80·9	109·5	68·0	...	...	...
	Derby	29·842	29·804	30·011	29·668	99·4	78·6	89·0	104·0	72·6	97·5	78·3	110·5	70·0	111	8	1,610
	Broome	29·836	29·815	30·013	29·700	93·3	78·7	86·0	103·4	69·2	93·6	79·0	108·9	69·3	315	7	1,012
	Condon	29·830	29·798	29·994	29·700	94·5	76·8	85·6	107·0	71·0	94·2	73·8	115·0	63·4	82	1	878
	Cossack	29·824	29·802	29·948	29·676	99·4	77·3	88·4	113·0	71·0	98·2	75·9	112·7	65·8	208	1	971
	Onslow	29·849	29·802	29·987	29·713	100·4	71·2	85·8	113·0	66·0	97·7	70·2	115·0	54·5	*Nil*	...	607
	Winning Pool ...	29·836	...	29·968	29·684	105·2	69·9	87·6	118·0	63·5	...	...	...	...	16	1	859
	Carnarvon	29·869	29·870	30·050	29·670	83·6	69·4	76·5	91·0	62·0	85·1	68·6	110 5	53·2	*Nil*	...	1,032
	Hamelin Pool... ...	29·902	29·866	30·090	29·789	94·7	65·5	80·1	106·2	58·8	95·1	64·4	111·8	53·2	*Nil*	...	754
	Geraldton	29·956	29·934	30·183	29·786	80·6	62·8	71·7	108·0	51·1	81·0	61·2	110·0	49·8	96	6	2,085
Inland:	Hall's Creek	29·848	29·811	30·110	29·630	103·2	78·3	90·8	109·8	67·0	100·6	75·8	110·2	60·0	198	6	894
	Marble Bar	...	...	...	...	109·0	79·6	94·3	115·9	73·0	105·7	75·5	118·8	65·2	143	14	1,038
	Nullagine	29·796	29·760	30·006	29·639	107·1	76·0	91·6	113·4	65·5	103·7	72·9	113·0	58·5	128	5	705
	Peak Hill	29·805	29·782	29·960	29·600	102·0	76·0	89·0	108·0	67·0	98·7	72·5	109·7	54·3	125	3	609
	Wiluna	29·798	29·753	30·001	29·588	101·2	72·5	86·8	109·6	58·0	96·2	68·5	110·1	53·9	76	5	617
	Cue	29·857	29·822	30·072	29·684	100·5	71·5	86·0	107·5	60·0	98·4	68·9	112·2	50·5	108	3	814
	Murgoo	...	...	...	...	103·2	69·8	86·5	108·6	69·8	...	...	...	...	70	2	581
	Yalgoo	29·848	29·845	30·146	29·661	98·9	68·2	83·6	109·8	56·0	96·2	64·7	113·5	49·8	48	3	1,022
	Lawlers	29·852	29·824	30·110	29·636	99·3	72·6	86·0	108·2	64·9	95·8	69·6	109·4	52·3	45	7	734
	Laverton	29·890	29·832	30·176	29·630	97·8	69·2	83·5	109·0	54·0	94·0	66·4	110·0	50·3	107	2	1,036
	Menzies	29·881	29·856	30·117	29·678	96·6	67·5	82·0	106·1	56·0	93·0	65·5	110·9	49·2	71	3	681
	Kanowna	...	...	...	...	97·0	63·9	80·4	104·0	50·0	...	...	...	...	140	3	704
	Kalgoorlie	29·928	29·892	30·207	29·677	94·5	64·6	79·8	105·7	53·3	91·0	62·3	110·0	47·9	257	2	803
	Coolgardie	29·917	29·887	30·193	29·663	93·7	62·9	78·3	105·4	51·6	90·9	60·8	110·2	47·6	120	4	786
	Southern Cross ...	29·914	29·879	30·162	29,651	96·8	62·7	79·8	111·0	52·0	92·1	60·2	111·3	46·9	105	3	743
	Kellerberrin	...	...	...	...	...	...	...	...	...	...	...	...	...	91	3	1,280
	Walebing	...	...	...	...	90·6	60·7	75·6	104·0	46·2	86·2	57·2	107·7	44·0	185	6	2,253
	Northam	...	...	...	...	92·2	61·3	76·8	105·0	52·5	88·5	58·6	109·1	44·1	139	5	2,158
	York	29·976	29·934	30·233	29·742	90·8	60·9	75·8	103·9	52·3	88·9	57·9	114·5	44·6	208	6	2,369
	Guildford	...	...	...	...	87·9	61·0	74·4	102·8	49·0	83·6	58·2	109·4	42·0	66	2	3,533

The Climate of Western Australia during December, 1905—*continued.*

Locality.	Barometer (corrected and reduced to sea-level). Mean of 9 a.m. and 3 p.m.	Average for previous years.	Highest for Month.	Lowest for Month.	Shade Temperatures. December, 1905. Mean Max.	Mean Min.	Mean of Month.	Highest Max.	Lowest Min.	Average for previous Years. Mean Max.	Mean Min.	Highest ever recorded.	Lowest ever recorded.	Rainfall. Points (100 to inch) in Month.	Wet Days.	Total Points since Jan. 1.
South-West and South Coast:																
Perth Gardens	29·976	29·961	30·242	29·775	87·0	64·2	75·6	99·4	55·0	82·9	60·6	107·0	49·0	70	4	3,400
Perth Observatory ...	29·984	29·968	30·248	29·806	83·6	63·0	73·3	91·0	54·0	79·9	60·1	107·9	49·2	77	5	3,462
Fremantle	30·012	29·972	30·262	29·835	78·3	64·0	71·2	94·8	56·0	76·5	61·6	104·0	51·5	53	5	2,737
Rottnest	30·014	29·952	30·237	29·855	76·0	64·0	70·0	88·8	57·6	74·5	61·8	102·0	50·7	30	4	2,529
Mandurah	...	...	...	...	84·1	60·6	72·4	98·3	48·0	79·9	57·9	99·8	43·1	67	3	4,247
Marradong	...	...	...	...	...	...	...	...	...	...	...	...	...	73	3	3,441
Wandering	...	...	...	...	88·7	52·8	70·8	99·3	43·0	...	...	...	...	389	6	3,849
Narrogin	...	...	...	...	84·9	56·1	70·5	98·2	45·8	...	...	...	...	122	7	2,656
Collie	...	...	...	...	85·0	54·6	69·8	95·7	41·4	80·1	50·8	100·2	39·5	76	4	4,109
Donnybrook	...	...	...	...	83·8	56·1	70·0	93·5	38·9	79·7	52·6	100·7	39·8	60	3	3,171
Bunbury	30·018	29·988	30·234	29·827	80·8	59·0	69·9	93·8	45·0	78·0	56·0	101·5	44·4	40	4	3,713
Busselton	...	...	...	...	83·1	53·8	68·4	94·0	40·2	77·5	52·7	93·0	40·2	13	4	2,966
Cape Naturaliste ...	30·023	...	30·233	29·827	74·4	58·4	66·4	88·0	50·2	...	...	...	...	53	3	2,917
Bridgetown	...	...	...	...	83·9	53·0	68·4	93·9	38·3	79·3	48·6	100·2	36·0	66	6	3,455
Karridale	30·040	30·002	30·248	29·785	76·1	55·4	65·8	90·0	42·0	73·6	54·4	101·0	43·0	92	5	4,570
Cape Leeuwin	30·019	29·974	30·257	29·661	73·4	61·6	67·5	82·5	54·4	71·3	59·8	98·4	53·0	89	8	3,832
Katanning	30·002	29·991	30·209	29·711	86·2	55·4	70·8	101·0	43·0	83·6	52·8	105·8	41·0	177	5	2,453
Mt. Barker	...	...	...	...	77·1	49·8	63·4	90·6	39·8	...	...	...	...	104	9	3,027
Albany	30·054	29·990	30·263	29·794	72·7	55·2	64·0	86·8	43·2	71·5	54·9	103·0	41·2	169	12	4,012
Breaksea...	30·058	29·985	30·294	29·678	68·8	58·6	63·7	77·5	53·2	68·1	57·2	94·0	46·0	140	13	3,732
Esperance	30·038	29·980	30·380	29·890	75·6	58·5	67·0	93·5	47·0	76·5	56·9	108·0	40·8	132	2	2,524
Balladonia*	30·023	29·990	30·275	29·674	88·1	55·3	71·7	108·1	44·2	83·9	54·4	108·8	42·5	158	3	769
Eyre	30·006	29·968	30·228	29·712	76·9	58·0	67·4	107·5	37·1	77·5	56·8	112·2	38·2	21	2	671
INTERSTATE.																
Perth	29·985	29·968	30·248	29·806	83·6	63·0	73·3	98·0	54·4	79·9	60·1	107·9	49·2	77	5	3,462
Adelaide	29·990	29·946	30·260	29·635	84·1	56·7	70·4	106·0	45·8	83·7	59·1	114·2	43·0	5	2	2,247
Melbourne	29·956	29·920	30·250	29·414	72·1	53·1	62·6	98·9	47·0	75·4	53·7	110·7	40·0	318	8	2,803
Sydney	29·940	29·918	30·190	29·540	74·0	62·0	68·0	85·0	56·0	77·1	62·8	107·5	49·3	273	10	3,503

* Averages for three years only.

The Observatory, Perth, 8th December, 1905.

W. E. COOKE, Government Astronomer.

RAINFALL for November, 1905 (completed as far as possible), and for December, 1905 (principally from Telegraphic Reports).

Stations.	November. No. of points. 100 = 1in.	November. No. of wet days.	December. No. of points. 100 = 1in.	December. No. of wet days.
East Kimberley:				
Wyndham ...	133	2	...	...
6-Mile	160	2	...	...
The Stud Station	...	...	...	...
Carlton	...	...	...	...
Denham	...	...	...	...
Rosewood Downs	...	...	..	...
Argyle Downs ...	...	...	...	...
Lisadell	...	...	...	...
Turkey Creek ...	189	4	168	10
Ord River ...	...	...	...	...
Alice Downs ...	...	...	...	...
Hall's Creek ...	112	5	198	6
Nicholson Plains	...	...	...	...
Flora Valley ...	...	...	...	...
Ruby Plains ...	...	..	...	...
Denison Downs	...	...	...	...
Kimberley Downs	172	5	...	...
West Kimberley:				
Obagama ...	123	4	...	...
Beagle Bay ...	...	...	...	...
Pt. Torment ...	Nil	...	...	...
Derby	17	1	111	8
Yeeda	...	...	...	...
Liveringa ...	68	2	...	...
Mt. Anderson ...	...	...	...	...
Leopold Downs...	61	4	...	...
Fitzroy Crossing	58	5	134	10
Fitzroy (C. Blythe)	50	1	...	...
Quanbun ...	15	1	...	...
Noonkanbah ...	149	3	...	...
Broome	3	1	315	7
Roebuck Downs	25	1	...	...
Thangoo ...	...	...	...	...
La Grange Bay	Nil	...	59	2
North-West:				
Wallal	Nil	...	53	3
Condon	Nil	...	82	1
Pardoo	Nil	...	...	...
DeGrey River ...	...	...	...	...
North-West—*cont.*				
Port Hedland ...	Nil	...	5	2
Boodarie ...	Nil	...	...	...
Warralong ...	Nil	...	...	...
Muccan	...	...	...	...
Ettrick	...	...	...	...
Mulgie	Nil	...	...	...
Eel Creek ...	Nil	...	...	...
Station Peak ...	Nil	...	...	...
Coongon	...	...	...	...
Warrawagine ...	...	...	...	...
Bamboo Creek ...	2	1	206	10
Marble Bar ...	Nil	..	143	14
Warrawoona ...	Nil	...	360	...
Corunna Downs...	Nil	...	...	...
Nullagine ...	Nil	...	128	5
Mt. Edgar ...	...	...	...	...
Kerdiadary ...	Nil	...	...	...
Bamboo Springs	Nil	...	...	...
Roy Hill ...	...	...	...	...
Middle Creek ...	Nil	...	...	...
Mosquito Creek...	2	1	...	...
Mulga Downs ...	Nil	...	...	...
Woodstock ...	...	...	...	...
Mt. Florence ...	Nil	...	...	...
Tambrey ...	Nil	...	...	...
Millstream ...	Nil	...	...	...
Yandyarra ...	...	...	...	...
Mallina	Nil	...	...	...
Whim Creek ...	Nil	...	Nil	...
Cooyapooya ...	Nil	...	...	...
Woodbrooke ...	Nil	...	...	...
Croydon	Nil	...	...	...
Balla Balla ...	...	...	...	...
Roebourne ...	1	1	1	1
Cossack	Nil	...	208	1
Sherlock ...	...	...	...	...
Fortescue ...	Nil	...	Nil	...
Mardie	Nil	...	...	...
Mt. Stewart ...	...	...	...	...
Yarraloola ...	...	...	...	...
Chinginarra ...	...	...	...	...
Onslow	Nil	...	Nil	...
Peedamullah ...	Nil	...	...	...
Red Hill	...	...	...	...
Mt. Mortimer ...	...	...	...	...
Peake Station ...	...	...	...	...
Wogoola ...	Nil	...	...	..

RAINFALL—*continued.*

Stations.	November.		December.	
	No. of points. 100 = 1in.	No. of wet days.	No. of points. 100 = 1in.	No. of wet days.
North-West—*cont.*				
Nanutarra ...	...	...	...	...
Yanrey	Nil	...	...	...
Point Cloates ...	...	...	...	...
Edmunds ...	Nil	...	...	...
Gascoyne:				
Winning Pool ...	Nil	...	16	1
Coordalia ...	...	...	...	...
Towara	Nil	...	...	...
Ullawarra ...	...	...	...	...
Maroonah ...	...	...	...	...
Gifford Creek ...	...	...	...	...
Bangemall ...	Nil	...	...	...
Mt. Augustus ...	...	...	...	...
Minnie Creek ...	Nil	...	...	...
Yanyeareddy ..	Nil	...	...	...
Williambury ...	Nil	...	...	...
Booloogooroo ...	...	...	...	...
Wandagee ...	Nil	...	...	...
Bernier Island ...	...	...	...	...
Boolathana ...	Nil	...	...	...
Carnarvon ...	Nil	...	Nil	...
Brick House ...	Nil	...	...	...
Doorawarrah ...	...	...	...	...
Bintholya ...	...	...	...	...
Mungarrah ...	Nil	...	...	...
Clifton Downs ...	...	...	...	..
Dairy Creek ...	Nil	...	...	...
Upper Clifton Downs	...	...	...	...
Dirk Hartog Island	...	...	...	...
Sharks Bay ...	Nil	...	Nil	...
Kararang ...	Nil	...	...	...
Meedo	Nil	...	...	...
Tamala	...	...	...	...
Wooramel ...	Nil	...	Nil	...
Hamelin Pool ...	Nil	...	Nil	...
Byro	Nil	...	...	...
Yarra Yarra ...	Nil	...	...	...
Berringarra ...	Nil	...	...	...
Mt. Gould ...	...	...	...	...
Moorarie ...	Nil	...	80	2
Wandary ...	...	...	...	...
Peak Hill ...	Nil	...	125	3
Mt. Fraser ...	...	...	...	...
Abbotts	Nil	...	85	...
Belele	...	...	...	...
Gascoyne—*contd.*				
Mileura	Nil	...	...	...
Milly Milly ...	Nil	...	...	...
Manfred ...	Nil	...	...	...
New Forest ..	...	...	...	...
Woogorong ...	Nil	...	...	...
Boolardy ...	...	...	...	...
Twin Peaks ...	...	...	...	...
Billabalong ...	Nil	...	...	...
Wooleane ...	Nil	...	60	2
Woolgorong ...	...	...	...	...
Murgoo	Nil	...	70	2
Yallalonga ...	...	..	...	...
Meka ...	Nil	...	80	3
Mt. Wittenoom...	Nil	...	41	2
Nannine	Nil	...	69	4
Star of the East	Nil	...	105	...
Annean	...	...	...	...
Tuckanarra ...	Nil	...	135	2
Coodardy ...	Nil	...	...	...
Cue	Nil	...	108	3
Day Dawn ...	Nil	...	78	2
Lake Austin ...	Nil	...	57	2
Lennonville ...	Nil	...	39	2
Mt. Magnet ...	Nil	...	44	2
Challa	Nil	...	35	2
Youeragabbie ...	Nil	...	92	3
198-Mile... ...	5	2	121	3
Nungarra ...	6	2	77	4
Murrum	...	...	120	2
Burnerbinmah ...	Nil	...	79	3
Barnong... ...	Nil	...	...	...
Mellenbye ...	Nil	...	...	...
Yalgoo	Nil	...	48	3
Wagga Wagga...	...	...	...	...
Gabyon	Nil	...	13	2
Tallyrang ...	Nil	...	...	...
Gullewa	10	1	...	...
Muralgarra ...	Nil	...	...	...
Wydgee	7	1	165	3
Wearagaminda ...	2	1	...	...
Gullewa House...	6	1	...	...
South-West Division (Northern Part):				
Murchison House	8	1	12	1
Mt. View ...	Nil	...	Nil	...
Mumby	Nil	...	...	...

RAINFALL—*continued.*

Stations.	November. No. of points. 100 = 1in.	November. No. of wet days.	December. No. of points. 100 = 1in.	December. No. of wet days.
South-West (Northern)—*contd.*				
Yuin	Nil	...	91	1
Northampton ...	7	1	61	2
Oakabella ...	...	...	...	...
Narra Tarra ...	...	...	...	...
Tibradden ...	14	2	38	2
Myaree	13	2	...	...
Sand Springs ...	Nil	...	...	...
Mullewa... ...	3	2	8	2
Chapman Experimental Farm...	Nil	...	34	1
Kockatea ...	Nil	...	48	3
Bootenal ...	...	...	...	...
Geraldton ...	6	3	96	6
White Peak ...	15	1	...	...
Greenough ...	Nil	...	90	1
Bokara	22	2	84	6
Dongara ...	Nil	...	73	2
Brookman's Hills	...	...	48	2
Strawberry ...	...	...	...	...
Nangetty ...	...	...	...	...
Mingenew ...	19	3	82	4
Urella	Nil	...	57	1
Yandenooka ...	Nil	...	66	1
Rothesay ...	...	...	...	...
Ninghan... ...	Nil	...	142	5
Condingnow ...	Nil	...	120	5
Field's Find ...	Nil	...	178	3
Carnamah ...	3	1	91	3
Watheroo ...	6	2	133	2
Nergaminon ...	11	3	84	4
Dandaragan ...	37	5	183	3
Moora	16	3	141	3
Yatheroo ...	26	2	...	...
Walebing ...	26	4	185	6
Round Hill ...	7	2	225	6
New Norcia ...	34	7	182	5
Wannamel ...	56	6	130	4
South-Western Division, Central (Coastal):				
Gingin	42	5	136	3
Belvoir	77	9	62	2
Mundaring ...	168	5	108	2
Wandu	118	12	69	6
Guildford ...	78	7	66	2
Kalbyamba ...	81	8	95	2
Canning W't'r'w'ks	143	9	95	3
Perth Gardens ...	60	7	70	4

Stations.	November. No. of points. 100 = 1in.	November. No. of wet days.	December. No. of points. 100 = 1in.	December. No. of wet days.
South-Western (Coastal)—*contd.*				
Perth Observatory	69	8	77	5
Highgate Hill ...	68	6	65	2
Subiaco	51	5	55	4
Claremont ...	29	...	...	...
Wanneroo ...	72	4	60	2
Jandakot ...	82	7	57	2
Fremantle ...	51	7	53	5
Rottnest... ...	37	7	30	4
Armadale ...	104	8	73	2
Rockingham ...	41	5	24	2
Mundijong ...	151	11	91	4
Jarrahdale (Norie)	177	10	110	4
Jarrahdale ...	202	7	148	4
Serpentine ...	115	9	53	3
Mandurah ...	90	9	67	3
Pinjarra (Blythewood)	145	10	100	2
Pinjarra	157	8	100	2
Yarloop	126	10	87	3
Harvey	139	9	82	4
Upper Murray ...	225	11	151	5
South-West, Central Part (Inland):				
Hatherley ...	14	1	158	5
Dowerin ...	22	2	100	3
Momberkine ...	36	4	...	...
Monglin... ...	...	...	...	...
Warramuggin ...	26	1	...	...
Newcastle ...	65	4	35	2
Emungin ...	81	4	153	8
Eumalga ...	67	4	...	...
Eadine	55	6	180	8
Northam ...	39	7	139	5
Grass Valley ...	75	...	166	...
Meckering ...	62	4	132	6
Cunderdin ...	42	2	...	...
Codg-Codgen ...	72	3	...	...
Yarragin ...	Nil	...	76	4
Doongin... ...	73	2	67	4
Cutenning ...	34	2	103	4
Whitehaven ...	20	1	...	...
Cardonia ...	45	3	...	...
Sunset Hills ...	70	4	140	4
Jelcobine ...	61	6	212	7
Cobham	36	5	177	6
Yenelin	...	...	...	...
Mt. Caroline ...	74	2	106	3

RAINFALL—*continued.*

Stations.	November. No. of points. 100 = 1in.	November. No. of wet days.	December. No. of points. 100 = 1in.	December. No. of wet days.
South-West (Central)—*contd.*				
York	55	6	208	6
Dalebridge ...	76	4	...	...
Beverley ...	32	3	143	4
Bally Bally ...	69	5	120	6
Oakdale	59	7	140	5
Barrington ...	36	3	154	4
Qualin	35	2	116	3
Stock Hill ...	56	2	100	1
Sunning Hill ...	78	10	140	7
Brookton ...	65	4	174	2
Wandering ...	177	7	389	6
Glen Ern ...	72	5	140	6
Pingelly ...	104	3	170	6
Yornaning ...	73	9	160	7
Marradong ...	112	9	76	3
Crooked Pool ...	80	7	121	5
Bannister ...	96	5	...	...
Wonnaminta ...	55	6	...	...
Narrogin ...	65	5	114	6
Narrogin State Farm	52	4	122	7
Wickepin ...	...	...	...	...
Gillimaning ...	77	5	...	...
Bunking ...	62	2	173	4
Bullock Hills ...	86	4	182	4
Bullingarra ...	...	...	...	...
South-West Division (Southern Part):				
Bunbury ...	71	8	40	4
Brunswick ...	98	5	60	3
Collie	153	9	76	4
Glen Mervyn ...	136	6	81	4
Donnybrook ...	138	8	60	3
Boyanup ...	107	7	74	3
Ferndale ...	124	5	...	...
Busselton ...	64	9	13	4
Quindalup ...	87	9	...	...
Cape Naturaliste	63	8	53	3
Glen Lossie ...	82	10	87	6
Lower Blackwood	129	9	52	2
Karridale ...	124	12	93	5
Cape Leeuwin ...	89	15	89	8
Biddellia ...	117	6	85	2
The Warren ...	...	..	...	...
Lake Muir ...	155	7	75	4
The Peninsula ...	...	...	...	...

Stations.	November. No. of points. 100 = 1in.	November. No. of wet days.	December. No. of points. 100 = 1in.	December. No. of wet days.
South-West—(Southern)—*cont.*				
Mordalup ...	30	3	65	2
Deeside	91	6	47	4
Riverside ...	115	6	75	6
Balbarup ...	129	7	53	4
Wilgarup ...	118	8	50	2
Cundinup ...	55	1	57	3
Bridgetown ...	114	10	66	6
Westbourne ...	84	8	79	3
Hilton	90	2	...	...
Greenbushes ...	158	7	56	3
Greenfields ...	122	6	...	...
Glenorchy ...	90	4	80	2
Williams ...	54	3	162	5
Arthur	67	3	75	3
Rifle Downs ...	82	4	...	...
Darkan	63	3	...	...
Wagin	49	3	155	...
Glencove ...	108	5	136	4
Dyliabing ...	112	8	138	5
Katanning ...	54	5	177	5
Kojonup ...	69	5	58	3
Broomehill ...	50	3	74	3
Woolgarup ...	43	1	85	3
Sunnyside ...	67	7	96	5
Talbot House ...	51	3	132	2
Woodyarrup ...	63	4	65	4
Mianelup ...	98	5	...	...
Cranbrook ...	77	6	95	4
Toolbrunup ...	73	2	...	...
Tambellup ...	77	3	182	4
Blackwattle ...	...	...	...	...
Woogenellup ...	78	5	68	5
Mt. Barker ...	101	8	104	9
Kendenup ...	111	5	97	4
St. Werburgh's...	113	6	109	7
Forest Hill ...	173	8	155	11
Wilson's Inlet ...	110	10	105	9
Grasmere ...	171	11	116	7
Albany	159	13	169	12
King River ...	113	4	93	3
Point King ...	156	8	126	4
Breaksea ...	143	14	140	13
Wattle Hill ...	136	11	95	12
Cape Riche ...	80	8	77	5
Cherilallup ...	93	7	...	...
Pallinup... ...	...	...	...	...
Bremer Bay ...	71	5	91	6
Peppermint Grove	61	4	87	6
Jarramongup ...	...	...	...	...
Chillinup ...	59	5	65	2

RAINFALL—*continued.*

Stations.	November. No. of points. 100 = 1in.	November. No. of wet days.	December. No. of points. 100 = 1in.	December. No. of wet days.
Eastern Division:				
Dural	8	1	...	...
Wiluna	1	1	76	5
Gum Creek ...	Nil	...	105	4
Mt. Sir Samuel ...	13	1	67	4
Lawlers	1	1	45	7
Leinster G.M. ...	...	...	...	...
Darda	40	1	...	...
Lake Darlôt ...	...	...	...	...
Duketon ...	...	...	...	...
Salt Soak ...	25	3	52	2
Mt. Leonora ...	101	1	24	1
Mt. Malcolm ...	39	1	31	2
Mt. Morgans ...	90	2	46	1
Burtville ...	...	...	...	...
Laverton ...	237	1	107	2
Murrin Murrin...	32	1	66	2
Yundamindera ..	67	2	24	2
Tampa	4	1	79	3
Kookynie ...	78	3	69	3
Niagara	73	3	29	2
Yerilla	38	1	146	3
Quandinnie ...	12	1	...	...
Edjudina ...	Nil	...	65	2
Menzies	57	1	71	3
Mulline	30	2	55	2
Waverley ...	10	1	...	...
Goongarrie ...	40	1	115	3
Mulwarrie ...	10	2	125	...
Bardoc	22	2	194	3
Broad Arrow ...	23	2	175	2
Kurnalpi ...	12	2	89	2
Bulong	34	4	124	2
Kanowna ...	26	2	140	3
Kalgoorlie ...	17	2	257	2
Coolgardie ...	21	3	120	4
Burbanks ...	11	2	154	4
Woolubar ...	10	1	248	5
Widgiemooltha...	27	3	169	4
50-Mile Tank ...	30	3	200	4
Waterdale ...	10	1	267	4
Norseman ...	50	3	237	6
Lake View ...	23	3	349	3
Bulla Bulling ...	8	3	279	3
Boondi	27	4	272	3
Boorabbin ...	14	3	262	3
Koorarawalyee..	18	1	207	4
Karalee	30	1	105	2

Stations.	November. No. of points. 100 = 1in.	November. No of wet days.	December. No. of points. 100 = 1in.	December. No. of wet days.
Eastern—*contd.*				
Yellowdine ...	54	2	125	2
Southern Cross ...	8	2	105	2
Parker's Range...	31	4	159	7
Parker's Road ...	...	...	...	...
Mt. Jackson ...	...	...	...	...
Bodallin ...	20	1	...	...
Glenelg Rocks ...	60	3	...	...
56-Mile	31	1	90	1
Burracoppin ...	...	...	137	5
129-Mile... ...	68	3	194	6
Emu Rocks ...	39	4	...	...
Baandee ...	10	1	110	3
Kellerberrin ...	33	2	91	3
Merredin ...	42	3	126	3
Nangeenan ...	13	1	95	3
Mangowine ...	Nil	...	60	4
Noongarin ...	Nil	...	93	4
163-Mile... ...	8	2	47	6
126-Mile... ...	1	1	...	...
90-Mile	Nil	...	99	3
Cowjanup ...	80	7	...	...
Eucla Division:				
Ravensthorpe ...	73	7	125	5
Coconarup ...	58	4	129	4
Hopetoun ...	123	2	133	5
Fanny's Cove ...	97	2	78	4
Park Farm ...	99	4	127	3
Esperance ...	107	4	132	2
Gibson's Soak ...	88	3	...	...
30-Mile Condenser	48	3	...	...
Swan Lagoon ...	45	2	...	...
Grass Patch ...	...	...	...	...
Myrup	98	4	103	5
Lynburn ...	53	3	...	...
Boyatup... ...	101	2	156	3
Middle Island ...	...	...	...	...
Point Malcolm ...	43	3	...	...
Israelite Bay ...	22	2	123	3
Balbinia... ...	...	...	...	...
Frazer Range ...	49	3	...	...
Balladonia ...	16	3	158	3
Southern Hills ...	...	...	...	...
Eyre	40	1	21	2
Mundrabillia ...	...	...	...	...
Eucla	7	1	6	2

The Observatory, Perth,
9th January, 1906.

W. E. COOKE,
Government Astronomer.

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OF

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EDITOR'S NOTES.

DIPPING SHEEP.—We would remind all those who keep sheep in the South-Western Division that all flocks must be dipped before the 30th April next. This regulation will be rigorously enforced.

YAMS AND TANNIAS.—A consignment of yams and tannias have been received by the Department of Agriculture from New Guiana, and have been forwarded to the Experimental Farm, Hamel, for trial.

PARASITES.—It is very pleasing to note that the value of the work of the Department of Agriculture in introducing parasites of orchard insect pests is fully appreciated, not only amongst our own fruit growers, but by growers in the Eastern States, who have written to this State for colonies of parasites.

NEW RAILWAY RATES.—In this issue is published a *résumé* of the reductions made on agricultural produce. In some cases they are very considerable, and the Commissioner of Railways is entitled to the thanks of all farmers for his efforts to meet them in conveying their produce to market at a cheaper rate than that hitherto existed. At the same time a corresponding reduction is made on all farming requisites carried into the country.

The National Show.—Mr. R. V. Uren, secretary of the Narrogin Agricultural Society, has received a letter from the Hon. the Minister for Agriculture stating that the Government has decided to hold the National Show this year at Narrogin. The Society intends getting its arrangements into train at once, and it will make every effort to insure the success of the fixture.

Destruction of Locusts.—As an instance of the immensity of the locust invasion in Argentina, the Locust Extinction Committee, which has its branches wherever the plague appears, reported recently that over 100 tons of insects and eggs were destroyed since the pest appeared in the affected districts; £50,000 was voted by the Federal Government for the expenses of the Extinction Committee on the first appearance of the plague.

Cherry Cultivation.—Inquiries are constantly being made as to whether cherries would grow well near Perth. From observations and experiments made, there is no doubt that it is very little use trying to grow cherries north of Narrogin. They require a loose deep soil, and ground that formerly had stinkwood and jam growing on it is generally found to be very good on the higher tableland through which runs the Great Southern Railway.

New Publications.—We have received a copy of the first number of the *Agricultural Journal* of India, a most praiseworthy production. The articles are written by men who are well versed in the particular subjects handled, most of which are illustrated with well-drawn and excellently printed plates. One very good feature is that all the articles, as well as the illustrations, are original. The subjects dealt with are purely sub-tropical and applicable, in the main, to the northern portions of this State.

Cork Dust.—Inquiries are made every season by grape growers who cultivate the better keeping grapes, regarding cork dust for packing. As demand for that article has as yet been very limited in Western Australia, it has not always been found possible to procure the article required. This season, however, growers have been well catered for in that line, and cork importers, the firm of Faulding & Co., Murray Street, among others, have received a stock to meet any demand that may arise.

Intending Settlers.—Mr. Boucaut, a prominent South Australian, recently paid a visit to this State, in order, amongst other things, to make an inspection of the land in the South-Western District on behalf of a number of German settlers who are anxious to come over here. Mr. Boucaut expressed considerable satisfaction at what he saw of the agricultural possibilities. He said, "The men I am interested in are all good settlers—indeed, they are the bone and sinew of the State—and I should be sorry if they left South Australia. Still, if they do decide to come to Western Australia, I do not blame them."

SCOURING IN CALVES.—Several complaints have been reported lately of scouring in calves. This is generally due to the want of proper sanitary conditions and neglect in regular feeding. The remedy consists in giving 1oz. to 2ozs. of castor oil in milk; two hours afterwards give one dessertspoonful of the following mixture:—

Tinc. Ginger	4ozs.
Tinc. Rhubarb	2ozs.
Essence of Peppermint	2ozs.

to be repeated every four or six hours, or until the discharge becomes natural. Very young calves only require half the above amount or a teaspoonful.

THE "NEW HORTICULTURE."—The advocates of the "New Horticulture" believe amongst other things that the following system of orchard work is the best:— "Non-cultivation after the trees begin to bear. Not neglect, but mowing often enough to keep all growth down. Until the trees begin to bear, any crop but small grain may be grown between them. Where the ground is rough and rocky and in sections of average rainfall, trees may be planted in sod, but they will grow less rapidly. A circle of about 3 feet should be hoed clean, the tree planted in a small hole in the centre, the earth around it well rammed, the circle well fertilised and mulched." We would warn our readers against adopting such methods, as it is against all good principles of cultivation, and is, in fact, "a lazy man's method."

THE PACKING OF FRUIT.—Acting on the suggestion of the Agent-General (Mr. Walter James), that some special inducement be offered to bring about an improvement in the packing of Western Australian fruit for London, the hon. the Minister for Agriculture (Mr. N. J. Moore, M.L.A.) has announced his intention of presenting a gold medal, valued at £10, for the best-packed consignment of apples despatched from this State to the home market during the season. Before arriving at this determination, the hon. the Minister consulted Mr. Jacoby, of the Producers' Union, when it was agreed that the giving of a valuable medal was about the best plan that could be adopted in furtherance of the Agent-General's object. All particulars with regard to the competition may be obtained at the Agricultural Department.

POTASH AND POTATOES.—For the last five years, at an agricultural station in Germany, plots have been arranged on which potatoes have always received dressings of farmyard manure, and other plots on which no farmyard manure has been applied but suitable quantities of mineral fertilisers, phosphoric acid with potash, and potash alone, in order to compare the different result, has been applied. The results show that when no farmyard manure, or only moderate dressings of it, is used, it is essential to apply potash, and that the effect of omitting this constituent is more felt by the crop than the omission of either nitrogen or phosphoric acid. The experimenter concludes his report with the remark that the results obtained by his trials serve to confirm previous experience that the potato crop is particularly grateful for liberal supplies of readily available potash.

Raising Orange and Lemon Trees from Seed.—A correspondent writes that he has a great desire to raise orange and lemon trees from seed, also passion vines, and asks for information as to how he should go about it. The matter being referred to the Horticultural and Viticultural Expert, Mr. Despeissis states that the seeds of oranges and lemons should be placed in frames containing sandy loam, in a bough shed, during the spring time. When the young plants are a few inches high, they are removed to small pots, about four or five inches; the pots are then placed in rows, and loose sand run between them until it reaches level with the top; this will keep them cool and moist. When big enough they are placed into the ground without disturbing the roots. Cutting the top root is recommended where the soil is shallow and overlies cold clay or water-logged subsoil. This also includes the superficial growth of fibrous roots and early fruiting. Passion fruit seed may be planted in pots straight away and treated in the same manner as mentioned above.

Anæmic Condition of the Blood Mare.—When it is found that mares are suffering from a deficiency of blood, a good way to get them into condition again is to carefully diet them and give the following alterative powders:—

Pulv. Gentian	2½ozs.
Iron Sulph.	2ozs.
Ginger	1oz.
Nit. Potass.	½oz.

make this into twelve powders, giving one daily in a small mash. Also take 12lbs. of whole linseed (not crushed) and boil (*i.e.*, allow to simmer after it has reached the boiling point) for 24 hours. Give half a pound of this, mixed with chaff and bran, in form of a mash once a day.

Cattle Bleeding from the Nose.—A complaint of cattle bleeding from the nose is sometimes found to be prevalent when animals have been unduly exposed during the wet winter months, and may always be prevented by keeping the animals comfortably housed; especially does this apply to dairy cattle. Animals suffering from this malady should be isolated in a place free from all draughts; feed on warm milk three times a day, and give one tablespoonful of the following mixture night and morning:—

Liq. ammonia acet.	3ozs.
Spts. nitros. aeth.	1oz.
Spts. camphor	2ozs.
Water	8ozs.

continue the treatment for a week or ten days, or until recovery. Keep the animals warm, and rug them when necessary.

A Cow's Digestive Capacity.—Dairy cows have for centuries been bred and trained for large consumption and assimilation of feed. They are relatively larger feeders and producers than the beef breeds. Loretta D., the champion cow at the St. Louis dairy cow demonstration, consumed daily

25·34 pounds of digestible matter per 1,000 pounds live weight, while the average capacity of the beef breeds is only about 13 pounds. She yielded 6·69 pounds of milk solids daily, or one pound to 3·4 pounds of nutrient consumed. Add to the milk solids yielded the daily gain in weight, her daily product during the demonstration was equivalent to a gain in weight of 10 pounds per day. This shows what wonderful powers of feeding and assimilation have been developed in the high type dairy cow. That she transmits both her feeding capacity and assimilating powers to her male progeny is becoming apparent in feeding experiments with dairy steers.

FRAUDULENT SEEDSMEN.—One of the difficulties which farmers have to contend with is that of getting good seed, "true to name." One farmer in the Buln Buln district, having decided, after much reading, to put in a crop of amber-cane, which should keep his cows going and in good condition after the usual maize crop was done, sent to Melbourne for the "best" amber-cane seed. This was sent up, and the price charged was 6d. per lb. He ploughed and prepared three acres, devoting a good deal of time to the preparation of the soil, and then sowed the seed. When the crop grew it turned out to be broom, and quite useless for the purpose intended, as broom requires cutting all at once, while amber-cane can be cut over a month or more. To make matters worse, the broom seed attracted all the parrots in the district. These birds then attacked the orchard and devoured the fruit. The farmer shot the parrots by the score, and the dead birds brought a horde of foxes about the farm. These destroyed his poultry and geese.

APPLE IMPORTS.—During the past ten years the apple exports from Canada and the United States reached the gigantic total of 53,000,000 bushels. Practically the bulk of the above entered British ports. Of this total during the ten years over 27,000,000 bushels were unshipped in Liverpool. London received 12,000,000 bushels and Glasgow over 8,000,000 bushels. The smallest despatches of apples from Canada and the United States were made in the season of 1895-6, when 2,253,765 bushels only were exported. The most prolific season was 1903-4, when 10,516,000 bushels were sent, chiefly to the United Kingdom. Large as these apple imports at first sight appear to be, as a matter of fact the total quantity received during the past ten years, if marketed in one season, would not provide a bushel and a-half of fruit to every one of the population of the four kingdoms for one year. Large quantities of apples are consumed in the United States. This season the total harvest was considerably over 200,000,000 bushels, of which between 5,000,000 and 10,000,000 bushels only will be exported.

NON-FRUITING OF MELON VINES.—Many practical gardeners hold the opinion that some plants, like the cabbage, and also pumpkins and melons, head and fruit better when old seeds (two to three years of age) are sown. This is an exception to the general rule, which shows that fresh seeds possess a higher germinating power and produce more vigorous plants. A French experimenter, Cazziola, found that melon and squashes raised from fresh

seeds bore a larger proportion of male (*staminate*) than female (*pistillate*) flowers, while older seeds bore more female than male flowers. This may be the reason of the scarcity of female flowers in certain cases. It is well known, however, that male flowers of plants of the melon and squash tribe usually appear five to six days before the female flowers, and also that they are much more numerous than female flowers. In this way, while plenty of pollen is provided, self fertilisation of the female flowers by the male flowers of the same plant is checked, and cross fertilisation, aided by the agency of insects and wind, is made easier. As a general rule, a practical result of cross fertilisations, is that more vigorous and hardier subjects issue. Some gardeners affirm that when growing pumpkins or melons it is advisable to mix a small proportion of new seed with the older seed, to provide vigorous and leafy vines with an abundance of pollen.

Capillary Action on Soils.—As many settlers do not seem to understand the capillary action existing in different classes of soils, the following very lucid remarks on the subject will be of value to them; they are taken from "The Soil," by A. D. Hall, M.A.:—"The relative powers of different soils to lift water by capillarity alone is well seen during any long dry summer weather . . . . . fields of Swedes grew till the roots were one or two inches in diameter, and then died outright, although the water table was not more than 16 to 20 feet below; yet the coarse-grained gravel of which the subsoil was composed could not lift the water in any appreciable quantity to the surface. In the same seasons the crops upon the chalk hills were quietly growing; though the water table was as much as 200 feet below the surface there was still a steady capillary rise of water through the fine-grained chalk. In continued dry weather it is always the gravels and coarse sands which suffer first, and this not because they start with less water, for that which they absorb they can give up almost wholly to the plant; whereas a clay, which absorbs much more, can only hand over about the same proportion to the plant as the sand did, so much being held as hygroscopic moisture. The plant suffers because the small surface of the soil particles gives the coarse-grained sand or gravel a very limited power of lifting the subsoil water to the roots of the plant."

Passion Vines Dying.—A settler, writing to the department, states that his passion vines are dying. He dug one up and found the root rotten. The place was visited by Mr. Despeissis, the horticultural and viticultural expert, who reported that "On examining the passion vines no disease could be discovered attacking either the stem or leaves. A few of the vines had died, while others were looking very sickly. The plants had been watered from a well, the water from which was somewhat sweetish to the taste, but not too highly mineralised. Soap-suds had also been used in rather too large a quantity, which was not good for them. The ground is of a loamy nature, with a stiff clay subsoil. By uncovering the roots and digging round them, a number of the larva or grubs of the cockchafer were found an inch or two from the surface. These insects, which are often turned up by the plough, are over an inch long, fat and curled up; they feed upon roots and decaying vegetable matter, and at times do a great deal of harm. They have

often been known to have been the cause of killing trees and shrubs when in full growth, the damage being done before their presence was suspected. They pass a couple of years in the ground before changing into the pupa state, and are found in this stage rolled up inside a brittle earthy covering, from which the beetle emerges in the spring. Continual hoeing will unearth a lot. Magpies and chickens will destroy a great number of them when an opportunity is given them. One of the vines had died from an attack of white ants, probably following upon the injury caused by the grub. A few holes should be made with a crowbar near the roots where white ants are suspected, and these filled with a mixture of sawdust and paris green. This is eaten by the ants, who die, and are afterwards eaten by the others. A good dressing of kainit will also do good in stimulating the growth of the plants and in killing or driving away both the grubs and white ants."

Pig Keeping for Bacon.—Why any occupiers of the land should neglect to keep pigs is hard to understand. Food is usually cheap. The pig is also capable of getting its own living for comparatively nothing, and the remainder is reasonably found in potatoes, roots, and damaged corn. I think generally too much attention is given to the sow when farrowing, as she is much better left alone. Attention then only excites the mother, causing her to lie on and smother her young. They should have a clean sty, with a moderate supply of short straw or cavins, and be kept with a limited quantity of food and plenty of water before and after for a few days. The losses will then be much smaller than if too much and frequent attention is given. It is surprising how soon the little ones, if given the opportunity, look after themselves in picking a few dry peas and drinking milk or milk and water. This mode of feeding should be adopted, and the owner will then find them make regular improvement, which does not slacken when the weaning season comes on, and a pig regularly and gradually fed commends itself to the feeder and consumer. When the pigs are weaned the mother can be kept sufficiently well for a few pence a day on offal, corn, water, and a few roots or scraps being used. When bacon is dear is a favourable time to prove the financial result between having a breeding sow and the feeding of several cattle. I am inclined to believe in the pig winning the race. A good and suitable mixture of barley, oats, and peas, ground and used with boiled potatoes or swedes, is much better and cheaper than feeding all meal. If a little milk is at hand, so much the better. Pigs change so often in value that I incline to the regular keeping of a few. They are the best scavengers, and great loss must accrue where there is damaged corn if the pig is absent. Of course, a man with cash in his pocket should generally purchase what he wants, but bought pigs seldom do like those bred on the place and that have been reared and fed with judgment.

Rabbit Destruction by Disease.—It is satisfactory to know that the movement for having the possibilities of dealing with the rabbit pest by means of a contagious disease exhaustively investigated is at last, after many difficulties, being brought to a successful issue. The subscription of a sum of over three thousand pounds by the pastoral finance companies practically insures the success of the campaign so energetically taken in hand by the New South Wales Pastures Protection Board's Council of Advice (says the *Pastoralists' Review*). Within a week or two the council should be in a position to guarantee Dr. Danysz the £4,600 he requires for coming out here

and starting an experiment station, and the rest of the funds required to pursue the experiments subsequently should be easily got together. If success should be achieved, the gain to Australia will be in millions of pounds sterling, and even partial success would be an immense gain, considering what an immense sum is now spent every year upon wire netting, poisoning, and other methods of dealing with rabbits. Dr. Danysz gives the most positive assurances that his methods will be harmless to sheep, birds, fowls, and other animal life, and the preliminary experiments on Broughton Island will put this point beyond question before any disease is used on the mainland. Having decided to experiment with diseases, it is satisfactory to know that the experiments are to be carried out under Australian conditions by the most eminent scientific authority in that branch of research, and whilst it is only right that the Government of New South Wales should appoint its experts to check the experiments, it is to be hoped that their control will not be exercised in such fashion as to bring the research to an inconclusive issue, as was the case when M. Pasteur sent out his lieutenants in 1888. It is a reassuring feature that though the Government has the right to control the experiments, it will not direct them, as in 1888, the management lying in the hands of the representatives of the stockowners who are bearing the expense, and will naturally be anxious to bring about a success, whereas when scientific men begin to differ the end in view is apt to be obscured by theoretical disputes, which soon become personal. What pastoralists want is a full and fair trial of every possible means Dr. Danysz and his assistants can devise for dealing with the pest—in short, a practical exhaustion of the scientific possibilities in this direction.

OUR ILLUSTRATIONS.

The illustrations printed in this issue are mostly taken from the country districts, and are a proof of what can be done in turning the bush into smiling fields.

Fig. 1.—Represents a scene in the early morning on the "Hotham River," near Pingelly. The tall reeds along the banks of the river are a sure sign of the permanency of good water.

Fig. 2.—Is a view of the Pingelly Mill, owned by Messrs. Harrison & Coy., and is situated at Narrogin.

Fig. 3.—Is a photograph of a crop of sorghum. This was sown the first week in October in virgin soil, and fertilised with 1cwt. of superphosphates to the acre. The crop was only ten weeks' old when the photo. was taken.

Figs. 4 and 5.—Are views taken from Messrs. Burges Bros.' well known farm "Tipperary," near York. Six Massey-Harris machines were used to harvest the crop; Mr. N. Burges putting up a day's record of 60 bags with one machine.

COLD STORAGE.

By A. D. Cairns.

Our fruitgrowers are beginning to consider what they should do with their surplus fruits. Now is the time to think the matter over and decide as to the best means to adopt, in order to secure a good return for their crops.

Owing to the comparative failure of the Canadian apple crops, and the short supply of the same fruit from California, the bulk of the apples from the latter place being far below the standard, has all tended to considerably decrease the amount of imports, so that while there is not much fear of low price markets it still behoves the larger growers to consider what is to be done with any temporary glut.

Growers are apt to defeat their own aims by rushing considerable quantities of fruit on to a good market, when the fact that on the large consignments arriving the market must go down.

Some growers are looking to the oversea trade to relieve them of any surplus fruit. While this is right enough, it must be borne in mind that in going to a foreign market competition of a much keener nature will be met with. So far as the growers in this State are concerned there is no better plan than the utilising the cold storage works. In the extracts taken from various sources, and reprinted at the end of this article, an idea may be obtained of cost of storage, together with the profit accrued by the using these means of keeping fruit good for a more favourable market.

In many cases here in this State, dealers and others visit orchards and buy up the whole of the crop, pack, and distribute it to various markets. Although this method saves the grower some time and trouble, it is a question whether, by thus avoiding any fancied risk, he does not forfeit a considerable share of the profits which, under a cold storage system, he might obtain. Again, at this particular time of the year, there is always plenty of storage room available, and consequently growers may be assured of most liberal consideration.

Assuming that 7s. 6d. has been the average selling price for a case of apples, and that 5s. was the price the grower obtained at the orchard, is it not worth while considering a means whereby the grower should get a little more of the profits?

Take the value of half a case of apples landed at the Government Cold Store platform at 3s.; allow 2d. per week for 25 weeks, storage rent; this would bring the cost up to 7s. 2d. per half-case, which, if placed on the market in a fresh and inviting condition in the months of October and November, when there is little or no fruit to be had, would command a good price—at the very least, 10s. and upwards.

The proposition is one well worthy the consideration of every apple grower. The half case is recommended for packing apples for storage, the measurements of which are 27½in. x 14in. x 6in. Twenty-three of the cases measure 40 cubic feet; cool storage averages 1d. per cubic foot per week.

This size case also has the advantage of allowing a free circulation of cold air that tends to keep the fruit in as near a perfect condition as possible.

The best apple for storage purposes is the slow ripening varieties. They should be carefully packed, and after two or three days storage to allow for shrinkage, rolled in paper, a sample of which may be seen at the Department of Agriculture, or will be forwarded on application. Apples thus packed will keep well for six months, and could then be put on the market at any time. Three days' notice should always be given to allow for "thawing out."

Individual growers, or a group of growers, could not do better than try an experiment this season with, say, one or two thousand cases.

Extract from "Shipping Index:"—

"Great credit must be accorded to those 'pioneers' who undertook the work of developing these distant markets by shipping their fruit as a principal means of relieving local requirements. Unfortunately, however, until this year, the results obtained have been anything but encouraging to the shippers. Not only have the rates of shipment been so exorbitantly high in comparison with other perishable products, but the shipping companies who were in a position to contract for the carriage of the fruit have seemingly neglected to maintain those conditions of temperature during transit which is completely necessary to the landing of the fruit in a good and marketable state. The freight, even at present slightly reduced rate of 72s. per ton, is altogether out of comparison with that of 45s. per ton charged for the carriage of rabbits, being a reduction from 80s., which has given such a remarkable impetus to the export of this commodity, and which it is only natural to presume would attend that of fruit exporting if similarly favoured.

It is estimated that the markets of Great Britain can command a ready sale for about 450,000 cases of Australian apples at an average price of 8s. per case, but against this the expenses total the high figure of 6s. per case, leaving the grower only 2s. for the labour of production and also the many necessary expenses such as picking, packing, and cartage, which have to be entailed. It can be readily seen, therefore, that such returns must not only be unprofitable, but very discouraging to shippers.

The action taken last year by the Commonwealth Government on the appeal of a deputation as the outcome of a Federal Conference of fruitgrowers' representatives from the various States, happily resulted in the passing of 'The Sea Carriage of Goods Bill,' thereby making the shipping companies responsible, not only for the delivery, but the safe carriage of all perishable products.

Undoubtedly, the accomplishment of this most desirable and necessary condition was of the greatest importance and value to the exporters of fruit, and it goes far to prove what can be achieved when united action is taken by those whose interests are so deeply concerned. That the securing of this condition alone will give a great impetus to the export of fruit is only to be expected, and with it we must in the future adopt improved and organised system and regulating method in sending away our fruits.

Although the season's export only lasts about ten weeks, the total quantity shipped from Australia in an ordinary year to the English markets is 450,000 cases, only a very small portion of which finds its way outside of London and Liverpool, which places, therefore, practically control the monopoly of the fruit trade, while other large and important industrial centres, such as Manchester, Birmingham, Leeds, Plymouth, Nottingham, Sheffield, Gloucester, Bristol, and many other large towns of England are mainly supplied with Australian apples only through 'buying agents,' who are, therefore, in a position to ask their own prices. It may be taken for granted, and evidence has been given by those in a position to verify it, that the profits of these agents are usually large, which in itself is a great disadvantage to the prospects of our growers, for not only does it deprive the rightful means of benefiting from the increased prices to be obtained from these sources, but it debars a much larger quantity of our fruits finding its way into consumption.

Dealing with this subject, in the *Australian Culturist* lately, Mr. A. J. Alden, who has had a life-long experience of the fruit trade in England and on the Continent, offers some very valuable information and advice:—'Most of the important centres in England,' he says, 'are to be found practically untouched by Australian fruits, also Cardiff, Swansea, Monmouth, and Merthyr Tydvil, in Wales; Edinburgh, Glasgow, Dundee, Aberdeen, and Berwick, in Scotland; Dublin and Cork, in Ireland; also, Brussels, Belgium, Amsterdam, and Rotterdam, in Holland; Hamburg, Bremen, and Berlin, in Germany; Paris, Marseilles, Calais, Boulogne, and Le Havre, in France; Genoa, Rome, and Naples, in Italy. Not only are our fruits unknown to most of these places, but there is also a general complaint of the dearth of supplies.' And further he goes on to state, 'One immense advantage to the Australian shipper would be to try and cater to the high-class trade; small packages of high-class fruit would meet at least 50 per cent. better values than the highest prices in the Covent Garden market by wholesale auction. This, undoubtedly, is the future to be aimed at by Australia.' That there is yet a very wide field, not only open but waiting, for the introduction of direct regular supplies of Australian fruit at very remunerative prices, cannot be denied. Last season a trial shipment of 500 cases were forwarded to Hamburg through the co-operative firm of Victorian fruitgrowers, with the following pleasing results:—

	Highest Price.	Average.
Jonathans	21/ ...	14/83
Cleopatras	13/ ...	12/21
Adams' Pearmain	14/ ...	12/75
Kirks	11/50 ...	11/27
Rome Beauty	10/ ...	9/84
Monro Favourite	15/50 ...	13/19
Reinette	11/50 ...	11/50
Aromatic	12/75 ...	12/61
Five Crown...	10/75 ...	10/52
Average net result	... 7/6 per case	

The satisfactory result of the testing of this new market by direct consignments will, no doubt, offer inducement to much larger shipments in the future, and probably some of the other continental markets may be entered upon next season with like pleasing results.

Should this be so, it will be necessary, not only in the interests of the shippers, but to the advantage of the markets also, that some system of

regulating supplies should be adopted. The flooding of any market, no mattter how extensive, is injurious to all concerned, as it must only result in a reduction of prices that will be quite unremunerative to the shippers, and in future have a tendency to deprive those markets of our fruits. It is pleasing to note from reports received concerning the Victorian apples shipped last season that they were in most cases of exceptional quality, and, therefore, commanded a ready sale, even though much larger shipments of American apples were on the market at the same time. The satisfactory prices obtained is very good evidence in support of such a statement, and it will be well if growers realise, even at the outset, that the shipping of inferior kinds of doubtful quality will hardly return much over and above charges. If the export trade is to be maintained and encouraged, the forwarding of only the very best fruits of the most suitable kinds must be a rule amongst our growers, without exception, and it is on this point we may hope to build up a name in the fruit trade of the world against all comers.

Most markets have their 'fancies' for particular varieties, and in order to meet this requirement it will be necessary for us to acquire such information as soon as possible. As a rule, a good middle-sized apple, not too green, with a clean red or yellow skin, without spots, blemishes, or bruises, and, above all, quite free from any diseases, and well graded, is required, and as these fruits are generally bought by those who can afford to pay the big price for them, they in return demand a first-class article.

There is very little doubt, however, that, if properly observed and carried out, the exporting of fruits to any of these foreign markets previously referred to must become before long a very extensive trade.

That we are in a position to grow first-class fruit, which has proved itself to possess good carrying qualities, has to be admitted, while on the other hand there are these extensive markets only too willing to take it at a profitable price, provided regular and reasonable shipments are made.

In view of this extension of trade, which must result, and also as a safeguard for the exporters, the appointment of an energetic and reliable representative in each of the most important centres seems most necessary, not only in the interests of the trade, but to examine and supervise the shipments as they arrive, and to regulate their disposal by the local firms. The small outlay in this respect that would be entailed would no doubt be fully recompensed by the saving that would result. Although the prospect of opening up this trade seems very bright, it will be wise to protect it against any losses that might in a reasonable way be avoided. One of the most useful means would also be the remitting of reliable information by these representatives from time to time concerning the state of these markets.

Taking into consideration that our season enables us to supply these great markets of the world when they are practically bare of local fruits, it may be seen that fruit exporters have a great opportunity offered to them, and it is to be hoped they will not only accept such, but cater for it in a thorough businesslike way to the complete advantage of the fruit industry of the State."

Extract from " Ice and Refrigeration :"—

"The chemical changes that take place in apples during storage are graphically pourtrayed and described in a bulletin issued by the United

States Department of Agriculture, Bureau of Chemistry, entitled 'Studies on Apples.' The experiments made proved, among other things, that oxygen is necessary in the ripening of fruits, and that the respiration of the fruit continues both in common and in cold storage. Unripe apples, it is asserted, breathe much more rapidly than ripe apples, and all apples respire faster at high temperatures than at lower ones, all of which goes to prove the necessity for moderate ventilation in apple storage rooms in order that the product of respiration, carbon dioxide, may be removed and that the necessary oxygen may be supplied. Most of the tests made were on the Ben Davis and Winesap varieties of fall apples and on some varieties of summer apples.

It is shown that early picked or immature fruit contains considerable starch, which disappears later, none being shown in the analyses after December and generally not after October or November. The analyses also show the gradual reduction of malic acid and of sucrose in the stored fruit, which reduction is more rapid in common than in cold storage, and more rapid in fruit picked before it is ripe than in fruit picked when fully matured. Thus in one of the tables it is shown that Ben Davis apples picked August 15th and removed from cold storage January 19th into common storage analysed ·589 per cent. of malic acid and 2·99 per cent of sucrose on January 19th, and on April 13th ·218 per cent. of malic acid and ·93 per cent. of sucrose; while Ben Davis apples picked September 15th and similarly treated showed ·543 per cent. of malic acid and 3·62 per cent. sucrose. In each case there was a nearly equivalent increase in invert sugar, or sugar broken up into dextrose (grape sugar) and levulose (fruit sugar). It was also shown by the chemical analysis that the apples held in common storage ripened much faster than those kept in cold storage, and that, before the samples were destroyed by rot, they had closely approximated the composition attained by apples in cold storage some months later. This is further explained in the bulletin as follows:—

'The percentage of total sugars expressed as invert sugar and of acids expressed as malic acid reached about the same figure in those kept in the laboratory as was reached at a later date in those kept in cold storage. In one respect, however, the composition of the Ben Davis stored in the laboratory changed in a manner very different from that of the sample kept in cold storage: In the former the sucrose decreased before April 13, 1903, until it reached a lower figure for sucrose than was found for the cold storage apples on April 27, 1904, more than twelve months later. The apples ripened in the laboratory contained a higher percentage of invert sugar and a lower percentage of cane sugar than those ripened in cold storage at the time when each of them was rendered useless by decay. In the case of the Winesap apples, however, this difference in the changes in sucrose and invert sugar does not obtain. Approximately the same minimum for the sucrose was reached in the apples stored in the laboratory as in those in cold storage, the latter having reached a minimum sucrose content about October 21, 1903, approximately seven months after the laboratory sample had been rendered useless by decay.

'It appears, so far as can be determined from this work, that the changes in composition (the content of starch, sugar, and ashes) in cold storage do not greatly differ from those which occur in common storage, the chief difference being in the rapidity with which the changes take place.

At the same time the fact that the changes which take place in storage at ordinary temperatures give higher maximum values for invert sugar and lower minimum values for sucrose in some instances than those occurring in cold storage is worthy of consideration and further study. As an illustration of this may be noted the scalding of apples in cold storage. Scald is probably caused or accompanied by a chemical change, but as yet this cannot be demonstrated by chemical analysis.'

Numerous analyses on fruit during different stages of growth demonstrated the fact that the less mature the fruit is when gathered the more rapid are the changes tending to maturity after picking. 'It would seem, therefore,' it is added, 'that from a commercial standpoint apples which are fairly mature may be expected to retain a more constant composition than those picked in an immature state.'"

From the Sydney papers:—

"At a meeting of the executive council of the Fruitgrowers' Union of New South Wales, held in the School of Arts, Parramatta, the matter of shipping fruit was discussed.

Mr. J. B. Brewer, secretary of the Interstate Fruitgrowers' Association, wrote stating that, in accordance with instructions from the late conference, he had arranged a deputation to the Australasian Steamship Owners' Federation, to ask for an improved system of interstate fruit carriage. The deputation was well received, and the chairman read a list of instructions recently issued to all their officers, which, if carried out, would leave little to be desired. He urged that growers should assist the companies by only using good, strong cases, well nailed, and legibly marked. Since the deputation, the association had written, stating that they had decided to reduce freight rates to Queensland by 10 per cent. from 1st January, 1906; also that a conference of wharf managers had been held, and the list of instructions had been issued by all the companies to their agents at all ports.

The delegates who had been appointed to confer with the agents in regard to the regulations of shipments of fruit to other States, the earlier closing of the markets, and the sale of fruit on commission, reported in regard thereto. No definite arrangement had been arrived at. Mr. Purser, one of the delegates, said, in regard to controlling the export of fruit, the agents looked upon the matter as worthy of consideration. He thought it could be controlled to some extent by holding the fruit in cold storage. They did so in America, and they seldom had a glut. He thought they might store fruit for five or six weeks under normal temperature, but not at freezing point. That was a failure. They wanted the dry-air system of cold storage. In regard to sale on percentage commission, the agents thought that was a matter between the grower and the agent. They could not undertake to sell at 7½ per cent., and bear the responsibility of returning the cases. The growers themselves had not personally complained.

Mr. L. Gullard said the regulation of the export trade meant that either the grower or the shipper must go out of the trade. It was in the growers' own hands.

Mr. A. W. Blood said if they arranged for cool storage they would have to arrange for a different system from what they had at present. It had been tried on a big scale, and had proved a total failure.

The chairman said he had stored citrus fruit for three months, and had not lost 2 per cent.

Mr. Blood said the Government provided cool storage for rabbits, poultry, and eggs. Then why not for fruit? He moved—'That this meeting of the Fruitgrowers' Union asks the Government to provide us with a dry-air system of cool storage.'

Mr. Bray seconded the motion, which was carried.

Mr. Rhodes moved—'That the secretary writes to Messrs. Geddes, Birt, and Co., asking if they had any system of cool storage other than freezing chambers, and if not, would they instal a system if they received a guarantee of patronage?'

This was seconded by Mr. Blood, and carried."

Those not thoroughly conversant with the many charges and dues that shippers of fruit to the other States have to face, when they read of oranges selling at 14s. and 15s. per case, imagine the grower or the shipper is reaping a good harvest; this is, when the prices of similar fruit in the Sydney markets at the same time are considered. A Central Cumberland grower, who ships largely, puts a different complexion altogether on the matter. He remarked: "Oranges are selling at 14s. and 15s. per case in Western Australia, yet it will not pay to send the fruit over there even at that price, because of the many incidental charges and local dues. Some people imagine that it is the consumers who have to pay for all this. Perhaps they do, but the grower has also to pay pretty dearly. And not only does this apply to our orange-grower. A Tasmanian grower informed me this week that he sent a shipment of apples to the West, and his net return was 1s. 6d. per case, notwithstanding the fact that his fruit realised 15s. per case."

DISTRICT NOTES.

BRIDGETOWN DISTRICT.

By T. Hooper, Chief Inspector Insect Pests Act.

I beg to report that, in company with Inspector Wickens, I have made a tour of inspection through the Bridgetown District. On either side of the roads in and around the town young thriving orchards bear ample testimony to the fertility of the soil, the industry of the settlers, and the general adaptability of the district for fruit culture.

The country, which is very hilly and heavily timbered, consists of a great proportion of good soil of a rich, red character. There are patches of ironstone gravel on which jarrah grows very freely.

In the darker and stiffer soils blackbutt and redgum are found growing luxuriantly. Fruit-trees when planted on this class of ground do remarkably well.

From Bridgetown to the Upper Blackwood we passed through miles of good country. In the whole of the district I found deciduous fruit-trees thriving, citrus fruits alone seem to be unable to stand the frosty weather that sometimes prevails. A pleasing feature of the orchards was the general freedom from all disease, red spider and woolly aphis being the only two at all noticeable.

SWAN DISTRICT.

By Inspector Barrow.

Extract from Inspector Barrow's report:—"It is often remarked that many of our sand plains and sand hills which are at present only producing banksia, jarrah, other timbers and scrub, should also be capable of giving some kind of feed for stock, and it is hoped that the Department of Agriculture may be able to solve this problem. I think it would be a great boon if the Director of Agriculture would establish some test plots promiscuously throughout the sandy districts, not necessarily on Government land, but within the boundaries of reputable selectors holdings, and experiment with such grasses or herbage of a kind as would be likely to thrive on such country and fatten stock. In this way, by placing the plot under the care of the selector upon whose ground it was established (sic) the expense of the Department would be very slight, and plenty of selectors, would be only too willing to assist all they could with the experiment. The urgency for the wider introduction of a system of mixed farming as now generally admitted points to the necessity of greater attention being given the production of vegetation suitable for stock.

[With reference to Inspector Barrow's remarks: that experimental plots should be established on selector's holdings, it may be as well to mention that the Department of Agriculture for years past has been giving seed away to settlers for experimental purposes, yet of the thousands of lots sent out only a few have ever supplied the Department with the results. The expense of importing the seed and sending it out has therefore, in a sense, been wasted, when looked at from an educational point of view.—Ed. *Journal.*]

WAGIN DISTRICT.

By Inspector Hewby.

I have completed my inspection of the land held in the Wagin Agricultural Area, and beg to report as follows:—

The Wagin Agricultural Area adjoins the Wagin townsite; it is situated on the east side of the Great Southern Railway, with a frontage of some six miles to the railway line, and contains 14,500 acres, of which over 11,000 are selected, 1,135 acres still available, and 2,185 acres reserved.

The quality of the land is very variable, ranging from rich, heavily timbered Morrell, Salmon Gum, and Jam country to gravelly plains and salt swamps. Most of the blocks still open for selection are of poor quality, and not likely to attract newcomers, but may be taken up as time goes on by those already on the ground who wish to increase their holdings. I have forwarded classifications of the vacant blocks under separate cover. The

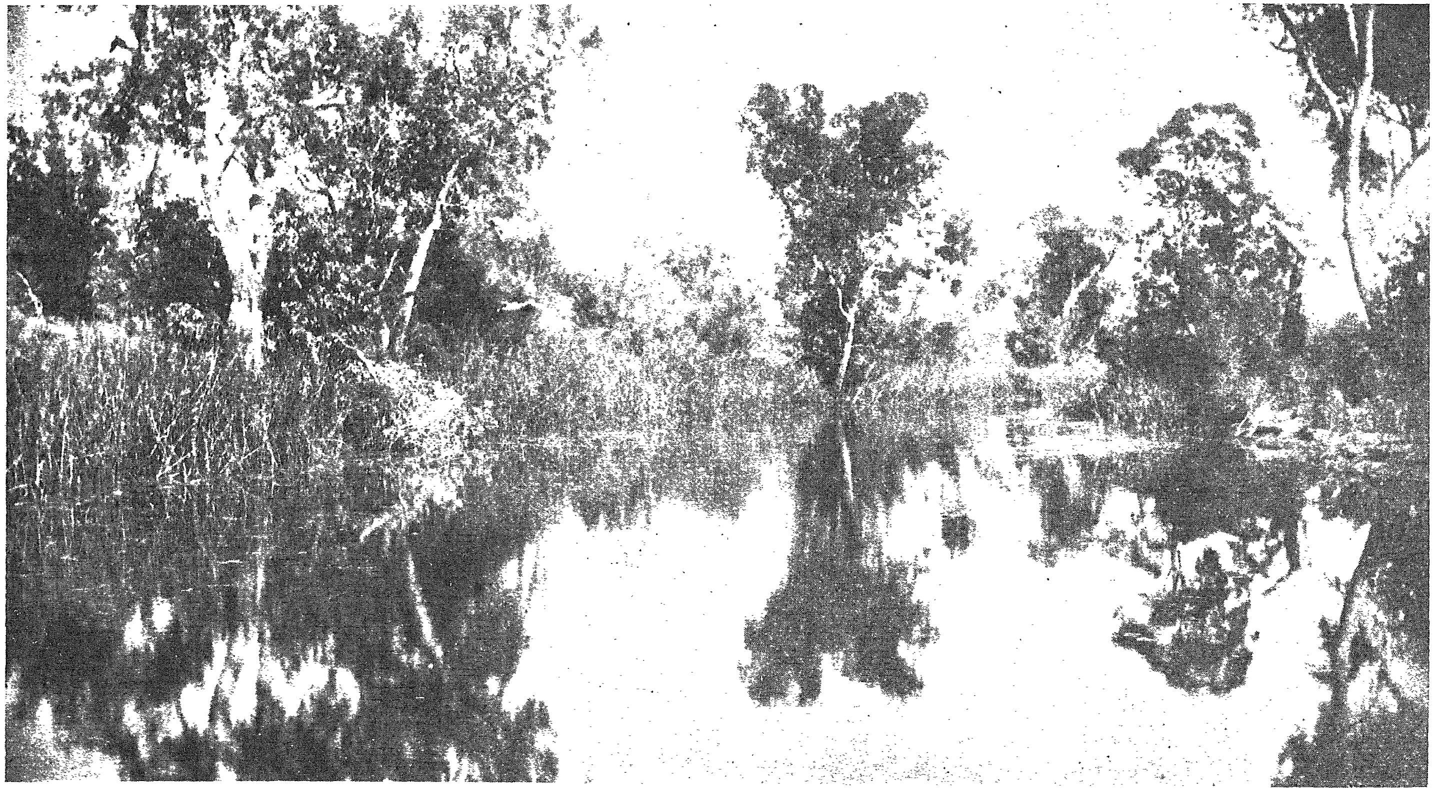


Fig. 1. Early Morning on Hotham River, Pingelly.

Wagin area does not appear to me to have been altogether happily chosen, for although there is some excellent land within its boundaries, there is a rather large proportion of second and third-class land, and I consider that an equal area of better average quality might easily have been selected within a reasonable distance of Wagin to declare an "Agricultural Area." Nevertheless, the majority of settlers are now progressing satisfactorily.

This area has undoubtedly suffered in the past, in common with much more of our agricultural land, from the fact of it being largely held for speculative purposes; this, however, is being rapidly remedied, and the right men are getting hold of the land by purchase from the original holders, and and are making good use of it. There are about 2,000 acres under crop this year, principally in wheat; the crops are good, and will be above the average of the district. I should place the return at 14½ to 15 bushels at least. Another 500 acres will be cultivated next season, and nearly 200 acres more, already ringbarked, can be cleared at a comparatively low price, as most of the ringbarking is from two to five years old, and the ultimate clearing will not average over £1 per acre.

I append a statement of the amount expended upon improvements. The sum spent on division fences and water provision is as yet comparatively small, for there is very little livestock held, the settlers at present generally devoting all their attention to cereals; but water is easily obtainable, and I fully expect in the very near future to see sheep or cattle on every holding, as the majority of the settlers are fully alive to the benefits of mixed farming, and have hitherto only been detained from possessing stock by the high prices ruling, the difficulty of obtaining stock even at those prices, and by the fact that the land requires a certain amount of preparation to make it capable of carrying the stock satisfactorily.

Although the Wagin area has been open for selection for some years many of the present holders are comparatively newcomers, and it takes time to provide sheep-proof fences, water, ringbarked and cleared paddocks, etc. The acreage under fruit I expect to rapidly rise during the next few years, as nearly all classes of trees, with the exception of the citrus, appear to do well. The annual rainfall is officially given on the plans as 15 inches, but it has averaged 19 inches for the past three years.

The improvements effected are as follows:—

			£	s.	d.
Clearing and cultivation,	2,074	acres, value ...	5,185	0	0
Partially cleared ...	450	„ „ ...	450	0	0
Ringbarked	1,816	„ „ ...	136	0	0
Orchard	40	„ „ ...	400	0	0
Boundary fences, 7, 6, 5, 3, and 2 wires, 41 miles ...			900	0	0
Division fences, 6, 3, and 2 wires, 6 miles			120	0	0
Buildings			2,210	0	0
Water provision...			470	0	0
Giving a total of			£9,871	0	0

or an average of 17s. 9d. per acre upon the 11,120 acres selected—a result which appears to me to be entirely satisfactory.

THE SUMMER FODDER PROBLEM.

THE FIG AS A FODDER TREE.

One of the great problems which vitally concerns the future of agriculture in Western Australia (says a writer in the *Western Mail*) is the discovery of some cheap, yet nutritious, fodder for the use of stock during the summer months. From the commencement of December till the end of April, and oftentimes even beyond this date, we have no grasses that can be grown on a commercial scale. Maize will grow prolifically over tens of thousands of acres of moist lands in the State, *paspalum dilitatum* thrives under favourable conditions, while there are good reasons for believing that lucerne—the king of fodder plants—will yet make a home in some of our southern districts. But even making the most liberal allowance for the good work which these fodders may perform in bridging the rainless period between November and May, the fact yet remains that so far as the great bulk of our agricultural lands are concerned they offer no prospects of relief.

A Pinjarra Enterprise.

At Pinjarra, one of the sons of Mr. Paterson, the manager of the Agricultural Bank, has launched out on a large scale in an undertaking designed purely to provide stock with suitable fodder during the hot months of the year. The enterprise takes the form of an extensive fig orchard. In the valley of the Murray River the fig tree makes phenomenal growth and yields heavy crops of luscious fruit. Mr. Paterson himself, as a native of Pinjarra, has had many opportunites of testing the value of the fig tree for fodder purposes. On the ancestral lands a number of these useful trees grew to perfection. They yielded more fruit than could be disposed of by sale. Horses, cows, sheep, and pigs were therefore turned in under the trees. The fondness which they all displayed for the fruit, and the manner in which they fattened on it did not pass unnoticed. For years Mr. Paterson has been an ardent advocate of fig culture. As soon as his own sons were able to take up the work he started them in the fig-growing business. There are already 41 acres under figs, and the intention is that the area shall by degrees extend to upwards of 100.

A Successful Development.

So far the trees have fully satisfied expectation. Those which five years ago were cuttings in a nursery are to-day large umbrageous trees carrying a crop of beautiful fruit. Good growth has also been made by the younger trees. In a recently-planted orchard of 31 acres, situated on the other side of the main road from the homestead, the young trees appear to have all struck. Although not more than 2ft. high, they are crowned with green foliage. In every direction the eye follows green-capped lines showing where

the trees have been planted. The outlook for this orchard is promising, and in two years' time it should make a very pretty sight. Beyond this 30 acres, another area of similar extent is to be planted during the next season, and in a few years young Mr. Paterson should be the owner of one of the most extensive and successful fig orchards in the Commonwealth.

The Best in the World.

There are three factors governing the problem which Mr. Paterson has taken in hand at Pinjarra. The first is embodied in the question: Will the fig tree thrive in the district? The reply to this is emphatic and convincing. In the first instance there is the record of the old trees that are plentifully scattered throughout the Murray flats. They tell in every fibre a story of congenial and fruitful surroundings. At the Serpentine there are fig trees which have grown to such dimensions that 10 cover an acre of ground. Mr. T. Hardy, the well-known South Australian fruit expert, who visited Western Australia after spending two years in travelling through the fruit countries of the world, expressed amazement at the magnificent growth which the fig tree made in this State. "They are the finest fig trees I have seen in the world," was his remark. Other travellers, including Mr. Despeissis, the State fruit expert, express similar sentiments.

A Splendid Fodder.

The next point has to do with the value of ripe figs as a fodder for stock. On this point local experience leaves no room for doubt. It tells a most convincing tale. Mr. Paterson supplies numerous instances where, in his own experience as an agriculturist, stock have done well on the ripe figs that fall to the ground with maturity. Store sheep he has fattened in three weeks; horses, once they get on to a fig diet, put on condition with great rapidity, and in a relatively short space of time become sleek and fat, and carry a coat possessing a sheen that suggests the results of industrious grooming. Pigs rapidly mount up in weight, while cows not only become fat but their milk is enriched in quality and increased in quantity. If these statements, for which chapter and verse were forthcoming, came from some sources there might be good reason for accepting them with considerable mental reservations. Mr. Paterson, however, is admittedly one of our most practical and experienced farmers, and when his statements are supported by the fact that what he preaches he also practices on an extensive scale, there can be no reason for doubting their trustworthiness.

As Cheap as Sowing Wheat.

The third factor is of a commercial nature. The preparation of land for orchard purposes is generally an expensive undertaking, then the fruit trees (say, 60 to the acre) have to be procured and planted, and finally the trees do not fruit to any extent until five years old. Much depends on what it costs to plant out, say, 30 acres of fig orchard as to whether the experiment will answer. Mr. Paterson's figures in this connection are reassuring. The ploughing and preparation of the land is perhaps a little more carefully conducted than if it were intended for a wheat crop. The trees raised by cuttings from existing trees can be obtained so cheaply that

Mr. Paterson found a £5 note covered the whole expense of finding sufficient for 30 acres. This, be it observed, is not a hypothetical estimate, but the record of actual experience. Yet it sounds strange to learn that a fig orchard can be planted as cheaply as a wheat field.

A Revolution in Agriculture.

Granting that Mr. Paterson's enterprise will answer its purpose, it can easily be seen what a revolution it means in local agricultural practice. From a full-grown fig tree a yield of half-a-ton of fruit is not regarded as an exceptional result. And, as Mr. Paterson points out, the fig tree is the most consistent bearer we have. With other trees we have seasons of plenty and seasons of scarcity, but the fig, year in and year out, keeps up a steady average yield. Sixty trees to the acre, returning, say, 25 tons of concentrated food, as ripe figs may rightly be described, is harvest which no other known crop can produce. Then some account is entitled to be taken of the leaves which, broad, green, and succulent, are in themselves a by no means to be despised food. Mr. Despeissis, who warmly approves of the Pinjarra enterprise, supports the theory of the edible nature of the fig leaf by recounting how, in the Sydney Domain, he found a herd of cows systematically neglecting the rich grasses that were obtainable in favour of the fallen leaves of a long avenve of Moreton Bay figs, along which they persistently grazed, evidently appreciating the fodder which, like the manna of old, had fallen down from the heavens for their benefit.

Bridging the Summer.

In addition, this valuable fodder thrives at the time of the year when scorching sun has dried all the indigenous and cultivated grasses to a mass of dry semi-indigestible fibre. By cultivating the right varieties, ripe fruit will be available from the 10th of December till after Easter, just the period of the year when a nutritious and cheap fodder is most needed. Many fig trees bear two crops during this period, and it is no uncommon sight to find the fruit in various stages of development from the embryo to the ripe fig just ready to drop on to the ground. For all stockmen, the fig tree promises, under Mr. Paterson's system, to be simply invaluable, while for dairying purposes its value, especially in view of the direct evidence which is offered on this point, promises to be incalculable.

An Unlimited Field.

Between Pinjarra and Perth the train passes through large areas of apparently inferior land. As we journey back to the metropolis, Mr. Paterson emphasises the value which the expansion of the fig industry means for their unutilised lands. "Instead of banksias there should be fig trees," he argues, with convincing enthusiasm, and draws an attractive picture of what the country-side would produce were it devoted to the cultivation of this valuable fodder tree.

Since the fig grows abundantly over the whole of the south-west land division of the State, from the Murchison River to Albany and from Bunbury to east of Cunderdin, it follows that the possibilities of the fig tree, for fodder purposes, are practically illimitable. It is impossible for one with a knowledge of the agricultural conditions of Western Australia, who

has personally inspected the fig orchards at Pinjarra, to deny the importance of the enterprise in which Mr. Paterson has so deeply interested himself. The man who made two blades of grass grow where but one grew previously is not to be compared as a public benefactor with the man who promises, by a very simple and yet natural means, to solve a pressing question for local agriculturists in making inferior lands yield forth in profusion a fruit which, in addition to having a great value as such, also serves a special purpose as a stock fodder.

To the Editor.

SIR,—The following from to-day's paper cannot be printed too often:—"One of the great problems which vitally concerns the future of agriculture in Western Australia is the discovery of some cheap, yet nutritious, fodder for the use of stock during the summer months. From the commencement of December till the end of April, and oftentimes even beyond this date, we have no grasses that can be grown on a commercial scale. Maize will grow prolifically over tens of thousands of acres of moist lands in the State, *paspalum dilitatum* thrives under favourable conditions, while there are good reasons for believing that lucerne—the king of fodder plants—will yet make a home in some of our more southern districts. But even making the most liberal allowance for the good work which these fodders may perform in bridging the rainless period between November and May, the fact yet remains that so far as the great bulk of our agricultural lands are concerned they offer no prospects of relief." Mr. Paterson has hit on a great idea, which should be acted on to the fullest extent. My object in writing is to draw attention to the equal advantages of the Carob as a source of fodder in times of scarcity, this also being more suitable than the fig for the "furthest back" goldfields, where carriage means so much. The Carob ought to be distributed without limit by the Government to every settler who applies. It would then become a great national asset.—Yours, etc., W.A.H.

Perth, 4th January.

Asked if the Department was doing anything in the way of distributing fodder trees, such as the Carob, the Director of Agriculture said that such a policy was unnecessary in view of the prolific growth of these trees in many parts of the State, and the obvious cheapness of the seeds. "Why," continued Mr. Chaplin, "for a shilling one would get sufficient almost to sow an acre." The Department, it might be said, recently imported seeds of the Guango fodder tree, and has since cultivated them at the Hamel Nursery. About 100 of these valuable plants are now ready for distribution.

CHAPMAN EXPERIMENTAL FARM.

By R. C. Baird.

This month has not, owing to the excess of moisture in the air, been a good one for thrashing operations. On a good number of days, work could not be commenced till about nine o'clock in the morning, and at four o'clock in the afternoon the moisture would render the straw so tough that the work would have to be stopped.

The rainfall for the month was 36 points, which fell on the 21st after a heavy dust storm had been raging for some hours.

The oil-engine which worked splendidly for a few days, has since been giving a considerable amount of trouble. The oil-pump, which appeared to be out of order, has been sent to Perth for repairs while we have reverted in the meantime to the old tread power for thrashing.

The thrashing of No. 19 paddock has been completed, and the returns are very satisfactory. Australian Cross-bred 77 gave a return of 16 bushels per acre, while "Jade" yielded 21 bushels per acre. The former variety was a third crop and treated with 100lbs. super per acre, while the latter was a second crop, also treated with 100lbs. super. per acre; the quality of the soil in both cases being similar.

Thrashing the Algerian oats in No. 18 paddock has been commenced, and judging from the results so far I expect the yield will be about 32 bushels per acre.

Advantage was taken of the rainfall on the 21st to give the orchard and vineyard a thorough cultivation, and the soil is now in fine condition. The fruit trees planted last winter are not doing well; the soaked condition of the soil at the time of planting prevented proper rooting, and little or no growth was made until the warmer weather set in, when the summer weather coming on almost immediately killed a large number of trees right out.

The vines made rapid growth until the potato moth attacked them, eating all the foliage off and killing a number of the plants. They are now, however, making fresh growth, and I hope still to have 60 per cent. of successes.

The pastures are now getting somewhat bare, but the stock are doing well on the stubble.

The two imported Dexter heifers have each dropped a bull calf, which are strong and vigorous, and both doing well.

The Angoras are doing better now than they have done hitherto. There are 16 kids with the flock ranging from two to four months old.

The stock on the farm are all in good healthy condition.

NARROGIN EXPERIMENTAL FARM.

By F. L. Faulkner.

Harvesting operations were completed during the former part of this month.

The following are the results of experiments :—

The Manure Test.

Plot No.	Kind and Quantity of Manure.	Cost per Acre.	Yield per Acre.	Remarks.
		s. d.	bush.	
1	Nothing	...	$8\frac{15}{16}$	Poor, thin, and backward
2	56lbs. Super. 36/38 % Rend. Sol.	2 3	$10\frac{3}{60}$	
3	112 ,, ,, ,, ,, ,, ,,	4 6	$16\frac{21}{60}$	
4	224 ,, ,, ,, ,, ,, ,,	9 0	18	Better than expected. *See* footnote
5	112 ,, ,, ... 4s. 6d. 56 ,, Sulph. Ammonia 8s. 6d.	13 0	$15\frac{5}{6}$	No result from addition of sulph. ammonia
6	112 ,, Super. ... 4s. 6d. 56 ,, Nitrate of Soda 7s. 6d.	12 0	$15\frac{4}{60}$	No better than Plot 5
7	112 ,, Super. ... 4s. 6d. 56 ,, Nitrate Soda (top dressed) 7s. 6d.	12 0	$20\frac{4}{5}$	Best plot of series. *See* footnotes
8	112 ,, Super. ... 4s. 6d. 56 ,, Sulph. Potash 8s.	12 6	$15\frac{1}{2}$	No beneficial result from any of potash dressings
9	112 ,, Super. ... 4s. 6d. 56 ,, Muriate of Potash 8s.	12 6	$14\frac{3}{4}$	Do.
10	112 ,, Super. ... 4s. 6d. 56 ,, Sulph. Ammonia 8s. 6d. 56 ,, Sulph. of Potash 8s.	21 0	$17\frac{1}{2}$	Looked well, but yield was disappointing
11	112 ,, Super. (top dressed August 15, 1905) 4s. 6d.	4 6	10	Not so good as Plot 3
12	112 ,, Super., 36/38% Super. ...	4 6	$15\frac{1}{4}$	A good, strong crop
13	112 ,, Bone-dust, 3·5% Nitrogen, 47·5% Tri. Calcic. Phos., ·13% Potash	7 6	$12\frac{3}{4}$	Not so good as Plot 12
14	112lbs. Phos. Guano, 58·17% Tri. Calcic. Phos.	2 9	12	Uneven in growth and backward
15	112lbs. Thomas's Phos., 35% Tri. Calcic. Phos.	3 6	$11\frac{1}{2}$	Backward and thin
16	224lbs. Gypsum	8 0	$10\frac{1}{5}$	Backward, and poorly headed
17	75 ,, Sulph. Ammonia ...	12 0	$8\frac{3}{4}$	Poor, backward, and thin
18	75 ,, Sulph. of Potash ...	12 0	8	Do.
19	No manure	...	$8\frac{1}{4}$	Do.

Particulars of the size of these plots, date of sowing, kind of land, and notes on their respective growth and appearance are to be found in the November, 1905, *Journal of Agriculture*, in the Experimental Farm Notes, and the results in many cases predicted.

On revising and taking into consideration the actual yields obtained these plots exhibit some interesting features.

In plots 1 to 4 (these constitute a "quantity of manure test") it will be seen that the dressing has been beneficially and profitably increased up to 2 cwt. The 2-cwt. plot, *i.e.*, No. 4, started very strong and thick, but from the very early stage seemed to suffer the most from the frosts and cold weather, and from the time it was six inches high did not appear to be responding well to the heavier dressing of manure. When it came to cutting and threshing, however, it proved to be more fully headed, thicker, and with fewer dummy heads than its fellow plots.

These plots also show the advantage of even a light dressing of manure over the no manure.

Plots Nos. 16 to 19 go fairly conclusively to prove that with the exception of phosphoric acid the addition of any other of the elements of plant food alone is of little or no avail.

Plots No. 5 to 11 show fairly conclusively that: 1. Potash is not wanted. 2. That the addition of nitrogen in the form of nitrate of soda as a top dressing to the growing crop is the only economical way of applying artificial nitrogenous fertilisers.

Plots 12 to 15 show the superior results obtained from the soluble superphosphate over the less soluble bone-dust, guano, or slag, even in a season that by the fact of its being so wet was a comparatively unfavourable one for the superphosphate.

The Variety Test Plots.

Sown 12th and 14th June, on virgin soil, part October fallow and part newly cleared, ploughed, and harrowed. Manured with $1\frac{1}{2}$cwt. of superphosphate, and 75lbs. of seed per acre. Plots, each $\frac{1}{2}$ rood.

WHEATS.

No.	Variety.	Yield per acre.	Remarks.
		bush.	
1	Alpha	$18\frac{3}{60}$	A really good early wheat
2	Australian Talavera	$16\frac{2}{3}$	One of the best all round early wheats
3	Jade	$13\frac{53}{60}$	Very large grained, mid. to early wheat
4	Sullivan's Early ...	$13\frac{33}{60}$	Early, plump grain, shelled badly; poor for hay
5	Medick	$15\frac{18}{60}$	A good stooling midseason hay wheat
6	Baroota Wonder ...	$16\frac{23}{60}$	Midseason to early; a good hay and grain wheat
7	Marshall's No. 3 ...	$16\frac{40}{60}$	Midseason; a long headed good yielding wheat, but requires early sowing
8	Fillbag	$15\frac{16}{60}$	Midseason; a good stooling, plump header
8A	Silver King	$18\frac{20}{60}$	Midseason; sister wheat to Marshall's No. 3; very rust-resisting; good milling and good yielding variety; requires early sowing
9	Federation	$19\frac{10}{60}$	Midseason; good yielder of good milling wheat; brown chaff, short straw; shells a little
10	White Lammas ...	$16\frac{40}{60}$	Midseason; nice soft hay wheat
11	Luckey Talavera ...	$18\frac{36}{60}$	Grew and stooled well; very similar to Australian Talavera in appearance, but grain dark brown, small, and strong floured; a very promising strong floured wheat, but rather mixed in type
12	Tardent's Blue ...	$15\frac{50}{60}$	Midseason to late; velvety chaffed wheat; requires earlier sowing
13	Gallart's Hybrid ...	$7\frac{30}{60}$	A hard flinty grain, large head and heavy beard; a late wheat, does best on heavy, wet low lands

FIG. 2. THE PINGELLY FLOUR MILL.

WHEATS—*continued.*

No.	Variety.	Yield per acre.	Remarks.
		bush.	
14	Plover	$16\frac{13}{60}$	Mid. to early; fairly good wheat
15	Toby's Luck	$18\frac{3}{60}$	Mid. to early; tall growing, good wheat
16	Crossbred No. 73 ...	$15\frac{33}{60}$	Very early, tall, small headed, and shells badly
17	Crossbred No. 100 ...	$15\frac{60}{60}$	Very early, poorly headed, and shelled out
18	Bobs	17	Late to midseason; a good stooling sturdy-growing wheat; gave fair crop of good milling small plump grain; better sown earlier
19	John Brown	$12\frac{1}{2}$	Midseason, stooling variety; requires earlier sowing
20	Bluestem (Manitoba)	$14\frac{10}{60}$	Late, strong floured; came away well at finish; requires earlier sowing
21	Power's Fife	$14\frac{26}{60}$	Very late and heavy stoolers, but came away
22	Whitney's Fife ...	$13\frac{53}{60}$	very well late in the season
23	Goldsmith	$14\frac{43}{60}$	A good headed, midseason to early variety; shells a little
24	Whitlock	$16\frac{25}{60}$	A good hay wheat, rather mixed in type
	Smaller Hand Plots.	Esmated Yield.	
		bush.	
1	Paros	15	A Greek variety — Appeared to be one and the same
2	Rubauka	15	One of the best macaroni wheats — Appeared to be one and the same
3	Medeah	16	(T. Durum.) A hard flinty grain, heavy beard, but solid saccharine straw; a heavy hay wheat
4	Champlan	15	A good stooling midseason wheat; did not grain well
5	Manitoba Red ...	10	Requires earlier sowing
6	Allora...	11	Grew and stooled well, but grain was shrivelled and poor

Oats.

Received practically the same treatment as the wheat, but sown at rate of $1\frac{1}{2}$ bushels per acre.

No.	Variety.	Yield per acre.	Remarks.
		bush.	
1	Early Ripe	$22\frac{1}{2}$	A tall growing, early oat, good for hay sample; rather irregular in colour and size
2	Algerian	$23\frac{3}{4}$	A good all round variety, good for hay, and gave good, plump, brown oat
3	White Siberian ...	$11\frac{3}{4}$	A good feed oat, but requires earlier sowing
4	Golden Fleece ...	$9\frac{3}{4}$	A nice oat but requiring earlier sowing
5	Calcutta	10*	On rather a poor piece of land
6	Trefoot	9*	A nice white oat, but too late

* Estimated.

NOTES.—Generally speaking, of all the varieties of wheat and oats sown the early varieties have done the best. The late sowing, *i.e.*, June 12 to 14th, being rather unfavourable to the heavy tillering late wheats.

A remarkable feature of the experiments was the way in which the late wheats, *i.e.*, the Fife wheats (2) and the Manitoba wheats developed and came away so late in the year as November. These varieties are all very desirable ones from the point of milling quality (a quality that will no doubt

have a deal to do with the selling of our Western Australian flour as soon as the time for export arrives), and I am confident that good returns will be obtained from them if sown early on well prepared, clean fallow land. It behoves millers of this State also to try and encourage the growth of these good milling strong floured wheats by giving the equivalent of the extra quality in the price. The direct benefit to the miller would thus be very great, but the indirect benefit to the State would be incalculable.

The Potato Crop.

The potato crop has been a poor one, due chiefly to the peculiar and unfavourable season.

Planting was done late in August and early in September, and the land was fairly black virgin land that had been fallowed since the October previous.

When planting was about half done a heavy deluge of rain had the effect of rotting and washing out a great many of the sets. After this downpour of rain practically nothing was registered until December, when the tubers were just ripening. This fall of nearly $2\frac{1}{2}$ inches in 10 days had the effect of restarting all the yet unripe tubers and preventing their thorough ripening.

The Variety Test:

Planted August 28th to September 2nd, 1905.

Manured with 10 dray loads of stable manure and 500lbs. of potato manure to the acre.

The potato manure was mixed from the following *Formulæ.*—Nitrate of soda, 64lbs.; dried blood, 220lbs.; superphosphate. 500lbs.; sulphate of potash, 200lbs.; and gypsum, 16lbs. = 1,000lbs.

The nitrate of soda was applied to the crop as a top dressing when the crop was well above ground.

No.	Variety.	Yield per acre.	Remarks.
		lbs.	
1	Northern Star ...	770	Most of seed washed and rotted by heavy rain
2	Beauty of Hebron ...	840	Badly washed out
3	Sutton's A1	1,400	Badly washed. Plants set well; good potatoes of good shape and size
4	Queen of the Valley	2,190	A lot of seed damaged. Plants set well; potatoes good shape and firm flesh
5	Manhattan	1,680	Most of seed damaged by rain. Set well shaped potatoes of good quality, purple skin
6	Northern Star ...	3,780	Potatoes grew and set well, but tubers small and elongated
7	Factor...	10,360	Plant did well and set potatoes and splendid shape and size, but inclined to rot
8	Evergood	7,420	Grew and set well, but badly attacked by grubs and black rot
9	King Edward VII. ...	7,280	Plants set well, but tubers rather small and inclined to black rot
10	Carmen	3,850	Set moderately. Tubers of good shape, size, and quality
11	Up to Date	4,830	Set small, tubers in abundance. Inclined to black rot
12	Early Rose	1,190	Poor seed planted. Bushes failed to set well, and tubers small

WEST AUSTRALIAN EXHIBIT AT THE MELBOURNE EXHIBITION.

By Percy G. Wicken.

The Exhibition was opened on 27th January by His Excellency the Governor-General, and is, so far, being well attended. The State courts form one of the features of the Exhibition. Western Australia is still to the fore, the court coming in for a good share of attention. The wild flowers which I took over have enabled me to dress the court in quite an artistic manner. The exhibits of grain and wheat, etc., are much admired, while the carved jarrah furniture and work from the public school form an additional attraction. I am enclosing you some photos. which will give you some ideas of the court; but as they are taken under electric light, they are not so good as might be; we have to keep the electric light going all day at this end of the building. Our court occupies 675 square feet of space.

Victoria has made a large exhibit; it is under the control of the Agricultural Department. Dairying forms one of the principal features; a separating, cheese-making, and milk-testing plant is kept going most of the day, while demonstrations by the poultry expert are given at intervals. Lessons in fruit bottling are given twice a day, while a flax-preparing machine is worked afternoon and evening. This machine, I understand, costs £150, and I will obtain further particulars, as it might be useful for treating flax in the West. Trophies of cheese, butter, hat-making, collections of wheat, grasses, and other specimens occupy a large part of the space. Rabbits, fowls, ducks, lambs, and pigs, packed for export and frozen, are sent down from the Government Refrigerating Works for a few hours every day. The Harnell milking machine is also shown in operation.

Queensland has a splendid collection of timbers, but the exhibit is confined to this one line. They have a splendid collection of 115 varieties of timber, both soft and hard woods, and which are well displayed, polished and plain panels, articles of turnery work; walking sticks are shown in great numbers. The exhibits are a great attraction, and should do much to induce business in this line. They have two representatives at their court, but the preparing the exhibit must have cost a good sum of money.

South Australia has only a very few items scattered over a large area; a few bottles of brandy and wine and a few articles from the Northern Territory. They cannot compare with the other States' courts.

New South Wales is not represented.

The body of the hall is well filled with a general collection of Australian made products, and should do much to induce people to patronise locally-made articles. The general exhibits include spirits, sauces, pickles, wines, preserves, oatmeal, macaroni, starch, biscuits, bacon, ham, soap, candles, essences, scents, oil, millet brooms, cattle foods, and fertilisers.

Agricultural machinery includes ploughs, harrows, strippers and harvesters.

Boots and shoes, as well as clothing, are made in the building. Hats, drapery, and woollen goods of all descriptions are well represented.

Hardware and goods made from iron are shown in large quantities.

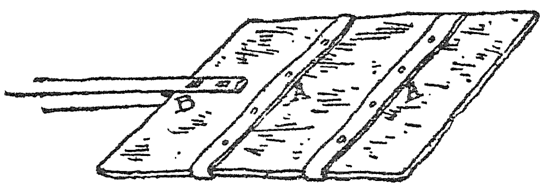
Nearly all these exhibits mentioned above are shown many times by different firms.

The Exhibition is open from noon to 5 p.m. and from 7 to 10·30 p.m.

A USEFUL FIRE-BEATER.

When we consider the terrible amount of damage, attended with loss of life, caused by the recent bush fires in the Eastern States, it behoves all settlers to have some means at hand to combat the ravages of fires.

"The fire-beater shown in our sketch is one in use at Bolindavale Estate, and has proved thoroughly trustworthy wherever it has been tried. It consists of a piece of stout bullock hide 2ft. long by 16in. broad. It is inserted in a cut made in the end of an ash fork handle, and secured by a couple of bolts and nuts (B). There are two pieces of hoop-iron across the hide, secured by rivets, but Mr. R. Clarke, a Victorian farmer, has arrived at the conclusion that the beater acts as well without the hoop-iron. Though the hide stands well, at times the beaters become shrivelled, and this winter Mr. Clarke intends tanning a couple of hides on the estate, as he believes leather fire-beaters would last for many years. His suggestion that the local shire council and roads boards should have a large number of these fire-beaters ready for use on any serious emergency is worthy the consideration of municipalities in all parts of the country."



The above appliance has been strongly recommended by the Landowners' Association of Victoria, who urges all farmers and graziers to keep at least a dozen of these fire-beaters always on hand, and to have fire-breakers around the place.

NEW RAILWAY RATES.

REDUCED TARIFF FOR AGRICULTURAL REQUISITES.

The revision of the railway rate book, together with the alterations decided upon, has been published in a special issue of the *Government Gazette* on Saturday, the 10th inst. The agricultural community has been considerably favoured. In many instances the reductions are very considerable.

Referring to the alterations that had been made, Mr. George said that it would be impossible in a limited space for him to review the whole of the work done. However, he could give instances, which would show the class of alterations. As far as the farmer, the miller, and also the consumer of flour were concerned, rates affecting them had been carefully revised. Reductions ranging from a few pence upwards had been made. A few examples were as follows:—

	Old Rate per ton. s. d.	New Rate per ton. s. d.
Grain 100 miles	12 5	11 9
„ 150 miles	15 5	13 9
„ 170 miles	16 7	14 7
„ 180 miles	17 2	15 0
„ 250 miles	21 3	18 1

"With regard to agricultural seed," Mr. George went on to say, "which were formerly in class 'A,' a distinct alteration has been made. For four-ton lots the rate will be as for for grain; for 10cwt. lots and more the freight will be class 'A'; and for 5cwt. lots and more the rate will be class 'B'—all at owner's risk. If sent at the Commissioner's risk, they will be all carried at first-class rates. The carriage on fencing wire, wire netting, etc., has been reduced to read as follows:—Four-ton lots, class 'A'; two-ton lots, class 'B'; smaller quantities, class 'C,' with the smalls minimum, all at owner's risk. The rate for the carriage of manures has been considerably reduced, and is now—For 10 miles and under, class 'M'; for distances over 10 miles, ½d. per ton per mile added to the rate for 10 miles."

The Commissioner pointed out that the concession to land selectors on live stock was formerly £6 and £12 respectively for four or eight wheel trucks. This had been reduced to £5 and £10 respectively. In order to encourage the breeding of live stock, and to enable stores to be sent to the country for fattening, the following rebates had been arranged for on a declaration being made that the cattle or sheep were being sent for either breeding or fattening purposes. The alterations made were as follow:—In one consignment two bogies of either cows or heifers or ewes, 10 per cent. reduction; four bogies, 15 per cent. reduction; six bogies, 20 per cent. reduction; eight bogies, 25 per cent. reduction. If for fattening, in one consignment, two bogies of bullocks, steers, or wethers, 5 per cent. reduction; four bogies, 7½ per cent. reduction; six bogies, 10 per cent.; 100 bullocks or upwards and eight bogies, 20 per cent. "It will be seen," Mr.

George said, "that we have endeavoured to give every encouragement to the farmer, not only at the start, but during the progress of the industry. All manures and seed are carried at a very low rate indeed. The settlers' fencing wire and standard are also carried at a low rate, and the live stock has also been considered in the alterations made in the rates. It is believed that this reduction will materially assist the selector in his early start, and the Department expects that it is really sowing the seed in assisting the farmer, and expects to reap a goodly return in freights during the years to come."

CODLIN MOTH OUTBREAKS.

By T. Hooper, Chief Inspector Insect Pests Act.

Inspector Newman, on the 12th January, seized two cases of pears infested with codlin moth grubs at the auction rooms in Perth, and on the 15th four more cases of pears. These, in each instance, were traced to Chinamen's gardens situated at the corner of Beaufort Street and Bulwer Street, Perth. The Chinamen stated that this was the first fruit picked from these trees this season. The trees and those in the neighbourhood were immediately stripped, and all the fruit was totally destroyed. The bark was then thoroughly scraped from these trees, collected on bags spread on the ground, and burnt. The ground has been thoroughly searched and all grass and rubbish destroyed, and contiguous orchards have subsequently had fruit destroyed.

On 18th January Inspector Whittington, while inspecting in Stirling Street, a few yards from the above place, found codlin moth larvæ in the fruit of one pear tree. No fruit had been sold from this tree. The fruit of this and adjoining trees was also stripped and destroyed.

Inspector Wickens, who was brought up from Bridgetown on account of pressure of work, and instructed to inspect the gardens in West Perth, found codlin moth larvæ in a garden in Duke-street on 2nd February. The outbreak in this instance was more serious than the previous one this season, a good many fruit trees being infected. The fruit was at once stripped and destroyed, while a careful search in the neighbourhood was proceeding at the same time. After some considerable time had been spent in searching, the pest was again found in an adjoining orchard on the 6th inst. The occupier of this orchard positively asserts that no grub, or workings of any grub, had been seen by him in his orchard until found on the date mentioned. His orchard, to my knowledge, has been kept very clean on account of fruit-fly. Therefore, I consider this is strong evidence that this outbreak points to being a fresh or separate one from that of Beaufort and Bulwer streets.

On 5th February Inspector Whittington also discovered the larvæ in another adjoining orchard.

This makes three orchards up to date in this neighbourhood (West Perth), and inspections are still proceeding.

The whole of this area was regularly inspected last season, but no traces of codlin moth had been discovered. The district is a very bad one for an outbreak to occur in, as there is a great number of very large old trees. On account of this second outbreak, in addition to these being gazetted as infected places, the whole of Perth will be placed under quarantine; and while at present all the fruit is being stripped and the bark thoroughly scraped and destroyed, further subsequent action of a drastic nature will be taken throughout the areas of Perth wherein the codlin moth has made its appearance up to date.

AUSTRALIAN AND TASMANIAN APPLES IN ENGLAND.

The following joint letter from Messrs. White & Son and two other firms of fruit brokers in Hull, with reference to the prospects of the sale of Australian and Tasmanian apples in that market, was addressed by Mr. A. Dobson, Agent General for Tasmania in London, to the other Agents General, and will be of interest to fruit growers:—

The Agents General of the Australian Colonies.

GENTLEMEN,—Referring to the privilege we had of waiting upon you as a deputation on the occasion of your recent visit to Hull, we have now pleasure in submitting, as requested, the following particulars with regard to the prospects of the sale of Australian and Tasmanian apples in this market:—

As you are aware, by reason of its geographical position, Hull is the natural port for the large district from Newcastle on the north to Lynn on the south and Birmingham on the west, a triangular area containing a large population of over ten millions, and embracing the densely-populated and large wage-earning districts of the West Riding of Yorkshire and the iron and coal country of the North of England.

The port charges of Hull, and the railway rates from hence to the districts mentioned compare favourably with those of any other port, whilst frequent and regular lines of steamers plying from Hull to Leith, Dundee, Aberdeen, Boston, Yarmouth, and also to Continental ports, give additional importance to Hull as a distributive centre. This proximity to the Continent also renders Hull possibly the most important centre for the distribution of summer fruits; this fact in itself attracting a regular attendance of most of the leading fruit merchants in the North of England.

There is a good opening here for your apples, because of the comparatively small supply now being landed here. Indeed, so far as

apples are concerned, Hull is very inadequately supplied owing to the absence of any regular lines of properly equipped steamers from the apple-growing countries; in proof of which we may cite the fact that whilst one-fourth of the total imports of hard fruits into Liverpool and London consist of American and Canadian apples, these goods only comprise one-fifteenth of the total imports into Hull.

It will thus be seen that buyers catering for over ten million inhabitants, in addition to the requirements for the Continent of Europe, for all of whom Hull is the natural market, and which buyers attend Hull regularly to purchase other fruit, are compelled to supply their requirements for apples in either Liverpool or London, with consequent heavier railway rates and loss through deterioration during transit.

We are confident that all varieties of apples shipped from your colonies would meet with an excellent market here, but are of opinion that the coloured fruits are most in request in the districts named; but to amplify, the following are the favourite varieties:—

Adam Pearmain	Scarlet Nonpareil
Scarlet Pearmain	Hoover
Sturmer Pippins, large	Cox Orange Pippins
,, ,, medium	French Crabs
New York Pippins	Cleopatra
Ribston Pippins	Crow Eggs
Alexandra	Blenheim Pippins
Newtown Pippins	Gravenstein.

We should add that we, the undermentioned firms, have been established in Hull as fruit brokers for a large number of years, and are thoroughly conversant with all the requirements of the trade. We hold public sales twice or three times every week, and practically the whole of the hard fruit, such as oranges, onions, lemons, grapes, etc., passes through our hands.

We need not remind you that the fact of our sales being public, and each parcel of fruit being duly catalogued, together with the standing position of our firms, is the best guarantee your shippers can have that they receive the actual proceeds of their consignments.

In the event of it not being possible to arrange for direct steamers during the coming season, we suggest that transhipment of trial consignments should be made to this port from London. The rates for each transhipment are, by steamer, about 11s. 8d. per ton, by rail about 28s. 7d. per ton, but it is quite possible that for larger parcels special terms might be obtained from the carriers.

In conclusion, we have pleasure in handing herewith *pro formâ* account sales, showing our charges, *i.e.*, for prompt sales. In the event of shippers desiring and instructing us to hold for any length of time, additional warehouse charges would necessarily be incurred.

Trusting that these particulars will embrace all the information you require, and placing our services at the disposition of your shippers,

We are, etc.,

(Sgd.) For White & Son, Ltd.,
,, W. Lambert White,
Director;
,, D. &. J. Shaw;
,, John Seed & Sons.

FIG. 3. SORGHUM CROP AT PINGELLY.

P.S.—We send account sales in duplicate, thinking they may be required for distribution.

The account sales show the number of boxes offered and price at per box. From that sum charges are deducted. These comprise:—

Brokers' charge for wharfage, landing, housing, delivery, rent, etc.	4d. per box
Freight and disbursements as paid—	
Brokerage and delcredere	2 per cent.
Cartage and marine insurance commission	3 per cent.

That letter having been referred to the Government Horticulturist, Mr. Despeissis offered the following remarks:—

The varieties of apples mentioned in the circular-letter, however desirable from the consumers' point of view in European markets, should be accepted with reservations by fruitgrowers in Western Australia, and, on the other hand, could, with advantage, be supplemented by well-tested varieties such as—

Jonathan	Chandler
Dunn's Seedling	Rokewood
Rome Beauty	Yates,
Stansill	

which grow and ripen to perfection over large areas of country in this State. Most of these varieties, while topping the market when sold alongside any of the varieties named in the fruitbrokers' list published above, are also amongst the most profitable from the growers' point of view.

With us it would be wise to refrain planting too extensively:—

Adam's Pearmain, which yields crops which lack uniformity and which easily drop off the tree;

Ribston Pippin, which is very subject to attacks of the woolly aphis and almost any disease that affects the apple;

Alexandra is not known or not grown under that name with us;

French Crab lacks colour, the tree is tender, does not bear a good crop every year, and has very tender buds, which are very easily affected by spray-washes;

Gravenstein is not a very good keeper, and burns, lacks uniformity, and does not ripen together;

Sturmer Pippin burns and is rather subject to ripe-rot when stored;

Scarlet Nonpareil and Scarlet Pearmain are rather small when grown on dry soil through our practically rainless summer.

Apples for Export (1906).

Bearing on the same subject, the following circular-letter, addressed by Messrs. H. G. Barker & Co., will also be read with interest by those desirous of exporting small initial consignments of apples to either or to both London and Bremen:—

Apples for Export (1906).

Acting in conjunction with Messrs. G. S. Yuill and Co., Ltd., of London, and Messrs. Lohmann and Co., of Bremen, Germany, who are well and favourably known in the European trade in Australian apples, and who will act as our selling agents in London and on the Continent during the ensuing season, we have, in order to keep West Australian apples before the English and Continental buyers of fruit, arranged for space for 200 cases in

the cool chambers of each of the following mail steamers leaving Fremantle on the dates indicated for London or Bremen, and/or Hamburg:—

For London—Orient Pacific s.s. "Ophir," sailing 5th March, 1906.
For Bremen and/or Hamburg—N.D.L. s.s. "Friedrich Der Grosse," sailing 14th March, 1906.
N.D.L. s.s. "Bremen," sailing 11th April, 1906.

As the time left for completing arrangements is short, we would esteem it a favour if you would kindly advise us by return whether we can count on you to ship by one, two, or each of these steamers. If you cannot ship by each, please indicate which steamers you are prepared to ship by, and the number of cases. It is important that not less than 10 cases for any one steamer be guaranteed, and, if possible, 20 cases should be offered. The varieties most likely to sell best at the time of year these steamers should arrive in Europe are Jonathans, Dunn's Seedlings, and Cleopatras, but other varieties should also sell well. Fruit for export may be picked as much as a fortnight before it would be ripe if left on the tree.

Although the local crop this season is not likely to be a heavy one, it should be borne in mind that the American crop last season was also light, and that little of it is likely to remain to compete with West Australian supplies in the London and Continental markets. Being nearer Europe by 10 days than Tasmania, West Australia has also a distinct advantage over that State in being able to get her fruit on the European market promptly, and should consequently obtain higher prices.

In Germany, apples are more of a luxury than in England, consequently only the best specimens should be sent—none less than $2\frac{1}{2}$ inches in diameter. For the English market nothing less in diameter than $2\frac{1}{4}$ inches should be sent.

Freight at not exceeding 70s. per ton of 40 cubic feet in the cool chambers of the steamers named above has been arranged for, and, as in the case of freight on all perishable cargo, must be prepaid here. We have, however, arranged to advance the grower the sum of 5s. per case on shipment, so as to cover approximately not only freight, but also other charges incurred here, such as grading, wrapping, packing, railage, outward wharfage, marine insurance, etc. Our European agents will render account sales promptly, and on receipt of these we will at once remit the growers the balance of net proceeds.

On receipt of advice of your requirements in the matter of space, we shall forward you full directions as to grading, packing, forwarding, etc.

We can supply you with cases and wrapping paper of the regulation patterns at the lowest possible prices.

Premium for the Best Packed Consignment of Apples.

In order to encourage local growers to look to the export market for the disposal of this fruit, the hon. the Minister has decided to offer a premium of £10 for the best representative and most successful consignment of well-packed apples arriving in London in good condition.

CONCERNING SEED WHEAT.

WHAT HAS BEEN LEARNED FROM RECENT EXPERIMENTS.

While farmers, grain dealers, and especially millers have generally lamented the occasion of such unusual havoc to the grain crop as characterised that of the past season, yet it may not be without some compensating advantages if growers will but take the very auspicious occasion to rid themselves of undesirable seed. It is hoped that the damage to the crop of 1905 may be more than compensated by the greater attention given to the selection and adaptation of seed, so that the ultimate result will make for profit to all parties interested in cereal culture.

Many of the conditions on which success in wheat-growing depends are beyond the control of the farmer. Other conditions, particularly the variety, purity and quality of the seed sown, are so entirely within his control that he alone must be responsible for the results dependent upon these factors.

Manifestly one of the main elements in the production of a strong seedling is a strong, sound seed. With cereal crops this is an ever-recurring question, and, unfortunately, is one frequently neglected by the parties most interested. Further, it is highly prejudicial to the highest results that there are numerous erroneous ideas, held very tenaciously, as to several points concerning seed wheat. There is little doubt but that much of the present condition of low yield is due to the lack of attention to the rational selection of first-class seed. This fact is being constantly emphasised by the inquiries made of the station as to the quantity of inferior seed which should be used to make up for its admitted deficiencies.

On account of the extreme conditions which obtain in most parts of the State with reference to seed wheat, as a result of the damage from the rust attack of 1905, it is deemed best to set forth some of the facts which seem to have been quite thoroughly demonstrated with reference to the matter of seed wheat. No apology is offered for thus presenting the work of other stations touching upon the points herein covered, inasmuch as the special cereal work inaugurated in this State by the California Experiment Station, in co-operation with the United States Department of Agriculture, has only been in operation for a single season, a period entirely too short to yield results at all conclusive from its own experience. The circular serves but as an introduction to the work, to call the attention of farmers to certain results which have been obtained elsewhere.

In the light of the positive evidence secured by numerous investigations it may be said that it is certainly possible to add to the vitality of our wheat crop through more careful and rational attention to the seed.

Effect of Change of Seed.—There is a very widespread belief among grain-growers that there is a necessity for frequent change of seed because of actual deterioration due to continued culture under the same soil conditions. This idea is held to such an extent as to be well-nigh universal. Yet the most carefully conducted investigations, without a single exception, go to show that not only is there no benefit to be derived from the mere change

of seed, but that actual loss occurs, except only where there is a change to a better type of wheat or to a more vigorous grain of the same type. But this is not the main object usually in the mind of the grower. Farmers are continually changing seed; the one having a stiff soil must have seed from a sandy soil, and he with a sandy soil must buy seed from a heavy soil. Then, again, seed is frequently brought long distances and often from regions of very different climatic conditions, with the hope that some immediate increase will be obtained in the yield.

Such indiscriminate change of seed is a most potent factor against proper seed improvement, and there will be little hope of improvement if one must give up a desirable strain every few years for one grown on some one else's land.

The North Dakota Experiment Station conducted some extensive experiments to thoroughly test this idea, "embracing 39 different samples of wheat of known history, representing the varied soils of the State." These samples were grown at the station under conditions which "make such comparative test of great certainty as to equality of condition. . . Wheat grown for a number of years on widely varying types of soils were then planted in direct and similar soil association." It was found that standard types of wheat of the same variety brought from different soils and grown side by side at the station, no matter how marked was the difference in the appearance of the original seed, all gave approximately the same results. "In those in which slight variations did occur, it was found that other elements constituted the matter of cause. That is to say, seed grain from a special type of soil has not been found to vary in the product because of the fact that it came from a peculiar soil."

These results were further corroborated by similar tests of injured wheats, the only apparent difference in these samples being that the product from weak seed was very inferior in quantity.

To further test the idea of grain from a change of soil, seed was sent from the station to various types of land in other portions of the State.

The result of these and other experiments indicates that varieties of wheat do not generate *per se*, at least within any reasonable length of time, by being grown continually upon any one soil; in other words, that a given type of soil seems to produce certain well-defined characteristics in the kernel of whatever variety may be grown upon it.

That Darwin, the great observer of Nature's laws, did not share in the idea of degeneracy is indicated from his statement: "I never have seen grain which has either been improved or degenerated by cultivation so as to convey the change to the succeeding crop." He also cites Dalbret as having cultivated 160 kinds for a period of 30 years, all of which kept true.

Results obtained at the Ohio Experiment Station further confirm this idea. Velvet chaff and silver chaff have been grown continuously without change of seed for twelve years; no loss of quantity or capacity to yield is noted.

At the Indiana station, Fultz, Michigan amber and velvet chaff have been grown eleven consecutive years. The average yield for the first ten years was 27·3, 29·4, and 29·8 bushels. The eleventh year (1894) the yields were 39·67, 35·66, and 27 bushels, from which Professor Latta says: "It is high time that the farmer everywhere should abandon the notion that wheat will 'run out.'"

Professor T. L. Lyon, of the Nebraska Experiment Station, in experiments continued from 1899 to 1904, comes to the following conclusion: "That a variety brought from a more humid to a drier climate will not do as well for a number of years as the same variety which has been grown in the dry climate continuously."

In the light of these carefully conducted experiments we may safely lay down the principle that unless the change be for the purpose of obtaining a better variety or a stronger seed there can be no advantage resulting from a change of seed wheat, and in case seed be purchased from a portion of the country where climatic conditions are quite unlike those of California the seed is not likely to be at its best for several years.

If seed shows signs of running out it simply means that proper care has not been taken in the selection of the seed to remove small, shrivelled, and light-weight kernels, and to use only plump kernels. With proper care in the selection of seed, wheat does not deteriorate from any change within itself. But to maintain the standard of yield care must be taken in the selection of the best seed, and to practice rational methods of rotation, manuring, and tillage to maintain the fertility of the soil.

Large *v.* Small Kernels for Seed.—This is another of the mooted questions among growers, and the evidence presented below is respectfully submitted for their consideration.

The Nebraska Experiment Station presents the following average yield for each two years, as follows:—

	1900. Bushels.	1901. Bushels.
From heavy seed	27·3	28·5
From ordinary seed	26·7	25·9
From light seed	21·8	23·9

The Tennessee Experiment Station presents the following data:—

	Weight of Grains. lbs.
Large heads—	
Large grains	2418·7
Small grains	2375·0
Medium heads—	
Large grains	2300·0
Small grains	2175·0
Small heads—	
Large grains	1850·0
Small grains	1868·7
General selection—	
Large grains	2087·5
Commercial sample	2068·7
Small grains	1887·5

The results given below were obtained by Dr. N. A. Cobb, New South Wales, the experiments covering three years, and were far too exhaustive to consider each separately. Suffice it to say that with numerous check plots the investigation embraced 24 varieties of wheat, separated into large, medium, and small grains, as in the above-named experiment, and the average results obtained were as follow:—

	Bushels per acre. 1st year	Bushels per acre. 2nd year
From large, plump grain	32·02	10·34
From medium, plump grain	26·77	8·66
From small, plump grain	24·86	6·50

Large and Plump *v.* Small and Shrivelled Seed.—For the present season the results presented under this head should have special application, since there are so many farmers, as a result of the extreme rust conditions of 1905, who have on hand nothing but badly shrivelled (pinched) seed. The question is being constantly put to the station authorities as to the value of pinched grain for seed purposes, and it is hoped that the following results secured by Dr. N. A. Cobb in New South Wales, in a most painstaking investigation, may prove suggestive. These experiments covered five varieties, which gave the following average results, they being uniformly in favour of the plump seed:—

	Bushels.
From plump seed	20·18
From shrunken seed	18·52

That the germination of such seeds is fair, is indicated by a test made by the writer of this circular, which showed 92 per cent. of the grain actually germinated; but the plantlets were very weak, and undoubtedly their vitality would always remain low.

The results are in entire harmony with what we know as to the necessity of securing vigorous, plump seed in the case of alfalfa and other crops. The same fact is recognised by the farmer with reference to the parentage of his animals; but, unfortunately, the idea holds that the case is different with wheat. It is to be hoped that grain growers will take advantage of the condition of much of the local supply of wheat to secure new seed and start with a good type of seed wheat.

In this connection it may be mentioned that there will be no more favourable time than this to make a trial of some of the harder winter wheats, especially that desirable bread variety known as "Turkey red," which gave so much promise last season when grown alongside of our more common varieties.—*California Experiment Station.*

POULTRY NOTES.

By Frank H. Robertson.

There are many persons who would like to go in for poultry breeding on a fairly large scale, but they meet so many friends who say don't, and thus act as a means of debarring further extension; there are also lots of croakers who say it's all very fine to talk about the profits to be made out of keeping fowls, but just tell us some facts in plain black and white, and let us know where these successful poultry farms exist, so that we can actually see them with our own eyes. Then there is another lot of persons who have started poultry-keeping and made a dismal failure of it. So for the edification of the above, and as a means of giving the general public an insight as to the management of existing poultry-breeders in this State, the writer has made an inspection of some of the places where poultry-breeding is carried on on a scale of greater magnitude than the ordinary rearing of a few hens, etc.

A Suburban Pig, Poultry Farm and Orchard (Messrs. Austin and Thomas).

Their place is reached by taking the Subiaco tram to its terminus at Thomas Street, and less than a mile walk brings one to an opening in the scrub, presenting the pleasing view of a rather extensive orchard, beyond which is an area of cleared land, and for a background is a dense scrub. Messrs. Austin and Thomas lease the property, which they took some five years ago, and consists of 15 acres, 10 of which are in the orchard and the remainder devoted to pigs and poultry.

There is nothing elaborate or ornamental to be found in any of the buildings, runs, or appliances appertaining to the poultry; utility and serviceableness receiving first consideration. About 400 head are kept, and they have the full run of the area devoted to the piggery, and as they are nearly all white Leghorns it can be easily imagined that the colour of their plumage is far from snow-white. They also have the run of the adjacent scrub land, and roam over a considerable area of country. Many of them roost in trees, but a good, big, airy iron house is provided to accommodate 200 comfortably at night-time. Near the house are about half a dozen nice-sized breeding pens, which contain the stock birds now going into moult. They are all laying-strain birds principally imported from the Sunnyhurst farm, South Australia.

Common fowls were first kept, and crossed with Spanish. White Leghorn blood was next introduced, then Andalusian, but all cross-breeding has now been abandoned, and the best procurable laying strains of Silver Wyandottes and White Leghorn only bred last year; but probably the only breed kept in future will be White Leghorns, as eggs for the market is the main object in view, as it has paid remarkably well, returning over £100 a year clear profit made by sales of eggs alone, which are all sold at the Perth auction rooms, as this system has been found to pay better than selling direct to the consumer or retailer. The firm's eggs are well known to the buyers and always fetch a top price. The following is a detailed statement of the eggs sold for 1904:—

January	78	dozen
February	82½	„
March	57	„
April	92	„
May	62	„
June	34	„
July	62½	„
August	198	„
September	259	„
October	149	„
November	134	„
December	132	„
	1,340	„

Net returns, £107 3s. 1d.; average price, 1s. 7d. per dozen.

The result for 1905 was hurriedly taken from the books while I waited, and gave the total as 1,475 dozen eggs; net return, £102 9s., giving an average of 1s. 5d., thus showing that the price is decreasing. Only on one

occasion did their eggs fetch less than 1s.; a large number were sold at 2s. 6d. to 2s. 9d., and occasional small lots reached 3s. The firm does very little showing or advertising, consequently the sales are not large to private buyers, most of the surplus stock being sold in the auction rooms. Pullets are never sold; as Mr. Austin remarks, buyers are not likely to give the price they are worth to us; a pullet coming on to lay now will give 20s. worth of eggs by next Christmas. A start has been made in ducks by bought eggs from Snell's Indian Runners, resulting in a nice little flock of about 40 birds.

The feed bill only amounts to about £12 a year for wheat, the bulk of the food being the same as the pigs', which is chiefly hotel and restaurant waste, and contains a good deal of animal food. The feed bill is thus a very light one and the sales of birds more than pay for it, so that the amounts received for eggs is all net profit. The losses by pigs eating fowls is very small, as they are not kept in small styes, but have the run of large pens, which prevents any chance of pigs getting the birds into small corners.

Hatching is done under hens, in addition to the employment of three incubators of 100 eggs each—Preddy's, Hearson's, and Cypher's.

Both members of the firm take great interest in their fowls, Mr. Thomas taking charge during the breeding season; and although both the orchard and piggery pay well, poultry does best, considering the amount of capital and labour involved.

No serious losses have occurred from disease; none with the grown stock, but colds among the young birds are the only complaints; very little doctoring is done; weaklings are destroyed, and strong birds shake off colds.

This establishment is a striking illustration of profitable poultry keeping, and not at all on the recognised lines of systematic poultry farming. Still it pays, thus showing that the industry can be carried on profitably under various conditions. This is one point that must always be borne in mind in poultry raising, viz., that management must vary according to the surroundings, and this can best be found by a combination of common sense and experiment.

Poultry as a Paying Hobby.

Some six or seven years ago Mr. R. A. Dusting made a start in poultry keeping by purchasing a few pure-bred Minorcas, and, gradually increasing his stock, had to look out for a larger area, and about three years ago, commenced operations, resulting in the neat little poultry farm described hereunder.

The land is a little over three acres, situated in Loftus Street, Leederville, easily reached by taking the tram up Oxford Street and getting out at Marion Street. Over the hill, in a nice sheltered spot, stands Mr. Dusting's pretty villa, at the rear of which are the runs extending back into the natural scrubby and well-shaded country such as we see all round the outskirts of the city of Perth. The land is mostly laid out in good roomy pens of various sizes. There are five, each 40 x 60 feet; four, 50 x 140, and numerous other small runs and duck pens; also large cockerel and pullet runs; 6ft. wire netting is used, with wire top and bottom and sapling posts. The fowlhouses are some wood, others ruberoid, and several iron; the last-named is preferred; all perches are made vermin proof, and very close to the ground; no scaly leg or bumble foot noticeable among the birds; in fact, all the

stock looked remarkably healthy and bright, although in about their worst time to find brilliancy of plumage, testifying well to Mr. Dusting's system of management. All fowlhouses are cleaned out before breakfast every morning, and the stock fed on a liberal scale; the first meal is served between 6 and 7 o'clock, and consists of mash, using hot water, boiled vegetables mixed to two parts of pollard, one of bran, and always a small quantity of oilcake. At midday is given a light feed of oats in litter and greenstuff; about 5 in the afternoon is given a small feed of whole wheat, oats, or barley, and the last thing is given a full feed of grain, as much as they will eat; frequently some left over which the birds get early next morning; green bone and bullocks' liver are used for animal food. In addition to the large number of separate pens, the corridor system is adopted for the best show stock. It consists of a substantial jarrah building with a passage down the centre, on each side of which are compartments 4ft. x 6ft., each separated by plain iron, with openings to the outside runs. At one end of the building is the feedroom, at the other the incubator-room, which is well packed to keep an even temperature. Only one machine was in use last season, viz., a 120-Model Cypher, which Mr. Dusting works successfully on the long airing system. The last was a very successful season, over 700 chickens raised, but there was a great preponderance of cockerels, which have been sold off, leaving now on the ground over 200 pullets.

The following varieties are kept, viz., black Orpingtons of high class show quality; Minorcas are a favourite breed and largely kept. The pen of last year's breeding stock make a fine display; the pens of Minorca pullets also promise first class-show stock; very few cockerels are kept. Golden Wyandottes are first class, the breeding pen headed by the winner at last Royal Show; a nice lot of young stock have been hatched from these. White and Brown Leghorns: of the latter a large number have been bred. The pen of 70 brown pullets in the large outer paddock make a most attractive display. They roost in a lofty tree, and look the picture of health. They are a good laying strain, as shown by records later on. A few Silver Wyandottes were hatched, but Mr. Dusting is going out of this breed, as the pen he had threw so many single comb and white birds.

Indian Runner ducks are a leading feature, and the strain kept is celebrated for its laying qualities, besides frequently scoring premier honours at leading shows. 300 were reared, and did not lose one; this is a remarkable record. Large numbers have been sold to all parts of the State at 2s. 6d. a head when ducklings. The waterfowl are kept in six roomy pens, and fresh water is supplied daily in portable ponds and troughs. A pen of 20 drakes, and another of 70 young birds. The next show season will no doubt be well represented by choice runners from this yard. Minorcas and Golden Wyandottes are also likely prize takers.

There is an ample supply of water obtained from a well and pumped by a windmill; a good supply of kale and other green feed is grown, but not sufficient to meet requirements, a neighbouring Chinaman's garden making up the deficiency. Mr. Dusting has business hours which enables him to devote every day until noon to his poultry. He does almost all the work himself, and the excellent condition of his stock, successful hatching, and splendid egg yield testify to his skilful management. Disease is at present quite absent, the only complaint causing any trouble being chicken pox, but this has been successfully eradicated. The financial results are quite

satisfactory; the eggs for the table are sold to the grocer, and these pay all expenses; birds and eggs sold for stock and show purposes are all profit, which last year made a clear gain of about £60; but, judging by the quality and number of birds raised this year, the credit balance should be very much larger.

The following are some of the records Mr. Dusting supplied me with. From four runner ducks 968 eggs were obtained in 12 months, making an average of 242 eggs per bird:—

Brown Leghorns	... 1,664 Eggs	... Average	... 208
Minorcas ...	... 1,492 "	"	... 186½
Black Orpingtons	... 1,218 "	"	... 152

The details of the records are as under:—

—	Apl.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.	Jan.	Feb.	Mch.
4 Indian Runners, 6 months old	18	49	74	69	98	85	102	111	115	106	89	52
8 Brown Leghorns, 5½ months old	20	34	112	160	165	173	183	191	171	194	121	140
Minorcas, 7½ months old	38	46	81	167	171	147	135	147	161	143	151	109
8 Black Orpingtons, 6 months old	9	34	49	84	168	116	127	116	147	123	161	84

All these records are good; the ducks and Leghorns much about the usual, the former in particular being of extra special merit, which means, at the average price of 1s. 6d. a dozen, the remarkable return of 30s. a bird for the 12 months.

The lesson learnt from this farm is that poultry as a hobby, and conducted by business men who have not long hours, can be made to pay handsomely, provided the right class of stock is kept and skilful management is combined with perseverance, early rising, and constant but not heavy manual exertion.

Poultry on the Mixed Farm.

Descriptions have already been given of successful poultry raising under two quite dissimilar conditions; the one now under discussion is also on totally different lines, being an illustration of successful management on an ordinary mixed farm.

Mr. Gladstone Heath's farm, which is situated about two miles from the Spencer's Brook Railway Station, consists of 260 acres of first-class wheat-growing land, which has only quite recently been taken up, cleared, and all improvements made in a very short space of time. The stripper was hard at work on the occasion of my visit, taking in a good crop of wheat.

The spot chosen for the residence, with fowlhouses and runs in close proximity, is well chosen, having a nice easterly slope to a gully which holds water nearly all the year round. The view from the front verandah is decidedly attractive. Dotted here and there can be seen little mobs of white fowls or ducks running about the area put under crop for their special benefit. Another lot are to be seen enjoying themselves on the lucerne patch on the other side of the gully, and beyond are the waving folds of ripening corn, now fast disappearing before the whizzing harvesting machine. The good

land is bounded by hills, terminating in the curious-shaped prominence known as Thomson's Head. When the recently-planted fruit and ornamental trees are grown the beauty of the aspect will be greatly enhanced.

Mr. Heath started by buying the best stock he could procure from Mrs. Bossley Jenkins, of South Australia, consisting of some of her best show White Wyandottes and Pekin ducks, with which Mr. Heath has scored the highest honours at our leading West Australian shows.

The past is practically Mr. Heath's first breeding season, and the presence of the large number of remarkably fine young stock shows that it has been a very successful one, having raised about 300 White Wyandottes and 150 Pekin ducks, not a fowl of any other description to be seen about the place. This is one of the best ways of keeping poultry, viz., all one variety. It saves a lot of trouble and worry, and the gain in effect is much enhanced, as fowls all of one colour look better than a number of breeds of various shapes and colours.

There are seven good breeding pens, each 30 feet x 120, supplied with the now well-known tent-shaped corrugated iron fowlhouses, as illustrated in the Poultry Phamphlet issued by this Department. The wire netting is 2-inch mesh, 6ft. high, jam posts, with galvanised wire top and bottom. The pens are at present occupied by the breeding hens, cockerels, and pullets, each lot of course separate, and a large number of young stock are scattered about in different places, all having unlimited range, some sheltering among the scrub, and several lots of late-hatched chickens still with their mothers in movable runs, on the slope of the hill. The ducks remain in the gully under the shade during the heat of the day, but forage about on unlimited run during early morning and evening. They are in four or five mobs, according to age, and are a grand massive lot, many show specimens noticeable among them; scrubbers and wasters none. The same can be said of the White Wyandottes. The old birds, now being in the moult, are not recognisable as the lovely snow white birds seen at the shows last season. The young stock, however, look very attractive, and many high-class show specimens among them.

The hatching was mostly done under hens, only one Cyphers incubator, 120-egg, and better results were obtained with hen eggs than ducks' in the machine. No losses occurred in the rearing, the brooders being the kerosene cases foster-mother, as illustrated in last month's *Journal*. The chickens were kept in lots of 40, and no artificial heat used even in the coldest weather. Chickens were chiefly fed on crushed wheat passed through the Enterprise mill and sifted, the fine stuff made into a mash with milk. Ducklings are reared chiefly on bran and pollard, to which is added a little oilcake; unlimited greenstuff supplied; a great deal of it mixed in the mash. All stock get boiled bullocks' liver twice a week. Boiled wheat is also largely fed to both fowls and ducks, and all feed is given perfectly clean, the mash being served off bags. At present there are not sufficient pens, necessitating some of the stock being kept in too close proximity to the house, but owing to the harvesting operations, time could not be found to make the additional runs.

The laying hens, in addition to their show qualities, are first-class layers, the egg supply being good even at this time of the year when moulting is in full progress. Mr. Heath is very well pleased with the past season's results, as well he might be; and, to use his own words, if a man uses his head a little

he cannot fail to make poultry pay well in a place like this, and you can never run short of food while you have eggs and cull cockerels to come on to.

Mrs. Heath is quite as enthusiastic as her husband, takes a very keen interest in them, and does a large part of the actual work of feeding and rearing and doctoring any sick birds.

The poultry on this farm is run on lines which may well be copied by hundreds of other farmers in this State. Here we see a start commenced with stock which scores the highest honours in the shows. They lay well, and hundreds of young stock are reared from them, thus showing that birds of good quality have powers of reproduction that could not be exceeded by the greatest mongrels or cross-breds.

A Country Poultry Farm and Orchard.

About four miles from the Chidlow's Well Station is located the Lakes Poultry Farm, owned by Messrs. Squires and Le Feuvre. The property is an old holding of 63 acres, 33 of which are cleared, 10 acres being devoted to poultry and orchard, and was only recently secured by its present owners, who are also interested in mining on the back block goldfields. One partner remains on the farm, and personally attends to the poultry. A great number of different breeds are kept, comprising almost all the well-known varieties, as follows :—

Pekin ducks, American
Indian Runner Ducks, Victorian
White Wyandottes, American
Brown Leghorns, Victorian
Anconas, Victorian
Minorcas, English and American
Houdans, Victorian
Buff Orpingtons, Victorian
R. C. White Leghorns, American
Langshans, American and Victorian
Black Hamburghs
Silver Hamburghs
Rose-comb Minorcas, American
Partridge Wyandottes
Barred Plymouth Rocks, American
Brown Leghorns, American
Black Orpingtons, Victorian and Western Australian
Rose-comb Brown Leghorns, American
White Plymouth Rocks, American
White Leghorns, Victorian
White Leghorns, American
Buff Wyandottes, American and Victorian
Golden Wyandottes
Silver Wyandottes, American and Victorian
Muscovy ducks
Bronze turkeys
Toulouse geese
Common and crossbred ducks and geese,

making in all 27 different varieties of pure-bred poultry, all of good quality, and bought at considerable expense, owing to being nearly all importations. The breeding pens are extra large, most of them being 66ft. x 40, and all laid out in the orchard, several fruit-trees being in each pen. All houses are made of ruberoid. On the other side of the road, on the borders of a lake covered with reeds, are a large number of small pens for ducks and other stock, also a couple of large iron fowlhouses for young stock and laying

hens, which have a free run. Here are a large number of fowls, a flock of geese, and hundreds of common ducks, which have free access to the lake. Then, near the residence, are several very large old sheds which are very useful for rearing chickens during the cold weather. A very good incubator-room 15ft. x 12 has been built by Mr. Le Feuvre, the partner on the farm. It is built on similar lines to the one on the Caurbrook duck farm at Kalgoorlie, but smaller. It has 6ft. walls, 3ft. being under ground, which is jarrah lined; the roof is iron, covered to a depth of 6in. with earth. All sawn timber is used, except for the uprights in the walls, which are made from stout saplings. It is proposed to strengthen the roof so as to allow it to carry another 6in. of earth; one window is provided. There is good ventilation from an iron air-shaft running well above the roof outside, passing down the barn wall, having its opening $3\frac{1}{2}$ft. from the floor of the incubator-room. A larger and wider shaft in the centre of the roof acts as an escape for hot air. The incubator plant consists of the following machines, viz., 360 Cyphers, 120 Model Cyphers, 200 Reliable, two 100 Prolific, and 100 Twentieth Century. Duck eggs are run at 102 to $102\frac{1}{2}$ for the first two weeks, up to 104 last week. Hen eggs are as near 103 as possible all the time. Duck eggs were found to do best with very little airing; the floor is moistened for all hot-air machines during warm weather.

Most of the Victorian birds were obtained from Wicker, of Diamond Creek; the American stock are all from the Reliable Poultry Co. About 500 head of young birds have been reared during the past season. All the stock are of good quality and in good health; many prize takers are among them. The whole farm is well managed, and has every prospect of becoming a success in every respect.

TREATMENT OF BROOD MARES.

By R. E. Weir, M.R.C.V.S., C.G.S.

In no class of breeding animal is roominess a matter of greater consideration than in the case of draught mares, chiefly for the reason that they are so often mated with sires of much greater weight than themselves, and unless their conformation is of such a character that foaling is made as easy as possible, difficulties will assuredly arise, and loss of a somewhat serious nature will accrue to the breeder. In addition to the above, they require to be compact and strongly built. Any approach to "legginess" is to be avoided. The low set, deeply built mare usually proves the best breeder, and selection on these lines will most certainly have the results that all should be anxious to attain.

Differences of opinion appear to exist as to the most suitable time that a young mare should get into foal. As a rule it will be found that sufficient development will have taken place at three years to allow satisfactory rearing of a foal without in any way unduly affecting the dam's condition. During the period of gestation it is advisable to keep the animal at slow, steady work in preference to running at grass. They will thus be kept from

becoming too fat, and the best conditions favourable to foaling will be established. Care, however, requires to be exercised for at least two months prior to foaling. During this period shaft work should be substituted for chain work, and gentle handling strictly enforced. Although the usual period of gestation (11 months) sometimes varies, yet in no other class of animal can any greater degree of certainty be arrived at, and for this reason the breeder usually has little trouble in determining about the date his mare will foal.

In the event of this occurring in the cold of winter, foaling may be allowed to take place in the stable; but should the climatic conditions be favourable, the freedom of a small paddock conveniently attached to the homestead can be allowed. As the act of foaling usually occupies such a short space of time, the animal's movements require to be carefully watched from the time that the first symptoms of approaching delivery are noticeable. When signs of uneasiness become pronounced, the attendant should be careful not to approach the animal, and not until a reasonable time has elapsed should any action be taken. When signs of difficulty become apparent an examination should be made, and if it is found that the presentation is a natural one, a little assistance usually has the desired effect. If, on the other hand, it is found that the head, or one of the fore legs, is turned in the passage, either must be brought into a straight line before any attempt is made to remove the foal; and if the attendant has not sufficient experience in work of that nature, no time should be lost in securing the services of skilled help. After delivery has taken place, a warm drink should be given to the mother, but beyond this perfect quietness should be insisted upon, as it will be found that when the mother and foal are left severely alone, better results are attained than when too much interference is permitted.

ANALYSIS OF FODDER PLANTS.

By E. A. Mann, Government Analyst.

I beg to furnish you with the following report on certain fodder plants submitted to me for examination during the last few weeks, and analysed by my assistant, Mr. S. C. Palmer.

I regret that owing to heavy pressure of work the report has been somewhat delayed.

The particulars of the plants examined are as follows:—

(1.) The leaves of the Blackboy.

(2.) The leaves of the Grass Tree.

It is frequently observed that cattle eat the leaves from these plants with apparent relish, and it was thought desirable to have some exact data as to their feeding values.

(3.) *Loudonia aurea.* Lindley.

(4.) *Opercularia vaginata.* Lobillardiere.

(5.) *Trichinium alopecuroideum.* Lindley.
(6.) *Kennedya stirlingii.* Lindley.
These are four native plants submitted by Mr. Charles Harper, Guildford, for examination.
(7.) African Wonder Grass.
(8.) *Eragrostis pilosa.* Palisot.
These are two grasses being tested as to whether suitable for summer pastures.

The results of the analyses are as follows:—

TABLE I.

	1.	2.	3.	4.	5.	6.	7.	8.
	Blackboy.	Grass Tree.	Loudonia Aurea.	Operculum-aria Vaginata.	Tri-chinium Alopecur-oideum.	Kennedya Stirlingii.	Wonder Grass.	Eragrostis Pilosa.
Moisture	66·66	59·29	8·10	7·73	8·82	8·10	74·21	46·70
Ether Extract, Oil, etc.	1·02	1·01	1·57	4·99	1·60	2·34	4·68	4·00
Fibre	14·53	17·54	33·67	27·71	24·93	20·87	4·71	18·31
Albuminoids ...	1·53	2·48	8·42	7·09	8·61	17·47	3·01	3·77
Carbohydrates (or Nitrogen free Extract)	14·16	14·94	45·24	49·46	51·54	48·48	4·51	22·98
Ash	3·10	4·74	3·00	3·02	4·50	2·74	8·88	4·24
	100·00	100·00	100·00	100·00	100·00	100·00	100·00	100·00

As some of the samples had evidently lost moisture before they reached me, I have calculated these analyses on a common basis of 75 per cent. of moisture, as follows:—

TABLE II.

	1.	2.	3.	4.	5.	6.	7.	8.
	Black Boy.	Grass Tree.	Loudonia Aurea.	Opercu-laria Vaginata.	Tri-chinium Alopecur-oideum.	Kennedya Stirlingii.	Wonder Grass.	Eragrostis Pilosa.
	Whole Blade.	Whole Blade.						
Moisture	75·00	75·00	75·00	75·00	75·00	75·00	75·00	75·00
Ether Extract ...	·74	·62	·31	1·35	·44	·64	4·54	1·88
Fibre	10·57	10·78	9·17	7·51	6·84	5·68	4·57	8·59
Albuminoids ...	1·13	1·52	2·39	1·92	2·36	4·75	2·91	1·76
Carbohydrates ...	10·30	9·17	12·31	13·40	14·13	13·19	4·37	10·79
Ash	2·26	2·91	·82	·82	1·23	·74	8·61	1·98
	100·00	100·00	100·00	100·00	100·00	100·00	100·00	100·00
Nutritive Ratio of Albuminoids to Carbohydrates	1 to 10·7	1 to 7·05	1 to 5·5	1 to 8·75	1 to 4·5	1 to 3·1	1 to 4·24	1 to 8·8

The Nutritive Ratio was obtained by adding together the Ether Extract (multiplied by 2·5) and Carbohydrates and dividing the product by the Albuminoids.

I also give the "*food units*" contained in the various plants as calculated from their actual analysis as received and also as calculated on a common content of 75 per cent. moisture. In this table are also introduced, for the sake of comparison, the food units of 18 grasses, Lucerne, and White Clover.*

TABLE III.

	1	2	3	4	5	6	7	8
Moisture found in each sample	65·68	59·05	8·10	7·73	8·82	8·10	74·21	46·70
No. of Units upon Dyer's Scale, calculated on the amount of water found in each sample	20·53	25·44	70·21	80·09	77·07	98·00	27·48	42·51
Calculated upon 75 per cent. water	18·6	19·8	24·0	27·2	26·5	33·5	33·2	25·0

	No. of Units according to Dyer's Scale, calculated upon 75% of water.
Mean of 18 grasses	25·5
Lucerne	28·5
White Clover	31·4

The figures are remarkable in several respects. The results for the native plants are surprisingly good, the proportion of the albuminoids in the Kennedya, which is of course one of our numerous legumes, being particularly high. Harsh and unattractive as these plants appear, they evidently contain valuable food constituents if they are palatable to stock.

The moisture contents of the various plants call for special consideration. As received, they contained from 8 to 75 per cent. of moisture; even making all allowances for partial dessication between collection and analysis, it it evident that the native plants naturally contain a very small proportion of water as compared with ordinary fodder plants, the 75 per cent. found in the Wonder grass being about the average of most grasses. This figure has therefore been adopted in Table II.

Theoretically (as laid down in text-books on the subject) the water contained in fodders is waste material, and is not considered as a nutritive constituent; but the point does not seem to have received the attention it deserves and which is demanded by our local summer conditions, especially where permanent summer pastures are concerned. A dry fodder admittedly causes a largely increased flow of saliva in stock, and necessitates, therefore, increased watering; while a certain proportion of moisture, if of no nutritive value in itself, has considerable bearing upon the *palatability* of the food. This is an important point, the actual nutrition of the body of an animal

* Taken from Johnston & Cameron's "Agricultural Chemistry."

FIG. 4. HARVESTING AT "TIPPERARY," YORK.

by any given food depending largely upon its palatability. Hence it has gradually come to be recognised that while theoretical nutritive values such as those given in Table III. may be arrived at by calculation, the real nutritive value of a food can only be obtained by actual feeding experiments upon stock, controlled and interpreted by chemical analysis. In the absence of a thoroughly equipped testing station and necessary conveniences, of course, such experiments cannot be conducted here, and we can only have recourse to theoretical calculations augmented by actual trials upon stock.

It is, for instance, a question which can only be settled by experience, whether the better returns would be obtained by feeding stock on the Kennedya and having ample provision for watering, etc., or with the Wonder grass relying largely on the natural moisture of the plant.

It would seem, however, that the Wonder grass, if it can retain this large moisture content through the hot months, should prove a most valuable summer pasture.

It will be seen that samples 5, 6, and 7 furnish a rather "narrow," while all the rest provide a "medium" ration; that is to say, that these should be rather "flesh-forming" than fattening fodders. According to Henry,* the best feeding practice shows that a "wide" nutritive ratio gives the best results.

EXPERIMENTAL PLOTS.

The following reports have been received from Mr. W. Saunders of Moonyoonooka:—

I have much pleasure in reporting on the experimental plots as follows:—Although our season, as regards rainfall, has been an exceptionally good one—the fall being greater than the average fall per season—yet growing crops about this part are not quite increased in comparison to other years with lesser falls. I have the plots divided and all in good order, and a hasty glance at the plan at once gives a correct view of everything, both as regards manures, seed, etc.

Plot 1, two acres (sown 8th June, 1905).—Two bushels Sullivan's Early Prolific wheat (one bushel per acre sown), with 2cwt. Japanese superphosphate.

Plot 2, two acres (sown 8th June, 1905).—Two bushels Sullivan's Early Prolific wheat (one bushel per acre); 3cwt. Japanese superphosphate and sulp. ammonia.

Plot 3, two acres (sown 8th June, 1905).—Two bushels Sullivan's Early Prolific wheat (one bushel per acre); 3cwt. Japanese superphosphate and muriate of potash.

Plot 4, two acres (sown 8th June, 1905).—Two bushels Sullivan's Early Prolific wheat, without fertiliser.

* "Feeds and Feeding," by W. A. Henry, 1903.

Plot 5, one acre (sown 19th June, 1905).—One bushel Jade wheat sown; 90 lbs. of superphosphate.

Plot 6, one acre (sown 19th June, 1905).—One bushel of Lawler's spring wheat; 90lbs. of superphosphate.

In viewing them as a whole they are very satisfactory, and the result will of course show very much better than last year, which result I hope to give you within two weeks, as I start next week.

I have had numerous visitors and a good deal of discussion has been entered into with regard to yields, which of course next week will be settled, and I think a deal of good will result from the plots as the one carrying no manures is very much behind others, showing that the old methods of farming must not be continued, otherwise a farmer's end will be Mt. Eliza.

Plot 1 in appearance shows out best.

Plot 2 runs No. 1 very close.

Plot 3 appears little inferior to No. 2.

Plot 4 of course brings back to mind "old methods."

Plot 5 although later, appears fair. On the lighter portion of the plot it appears good, but on the stiffer land it appears to be slightly blighted owing no doubt to easterly blows.

Plot 6 is also fair, and is on a piece of new ground which will doubtless help it.

Peas.—The inoculated and plain peas have turned out well, in fact, a good crop. There is not the difference I expected to see, and I fear Dr. Moore's theory is not going to turn Moonyoonooka into an Eldorado; however, I hope to have another try this coming season.

Clover.—This, I regret to say, is a failure. Seeds did not germinate.

Cow Peas and Maize.—Arrived rather late in season and must try these earlier another year; what I have growing have done well, but the warm weather now will affect them I think.

SECOND REPORT.

In connection with the experimental plots conducted by me at this farm I now have pleasure in reporting on same, following my report of November last *re* probable yield. I trust you will find same satisfactory. I consider the yields good, but owing to the early wheats shedding, a considerable amount of grain was lost. Over all plots I consider quite six bushels per acre lost. My position is open to southerly gales, hence the loss; otherwise the yield would, of course, have shown a real good one. The plots have been watcned with interest by outsiders. Boards, etc., have been erected so that visitors have been able to observe exactly what had been done.

Moonyoonooka Farm Yields.

Plot 1 (two acres).—Two bushels Sullivan's Early Prolific (one bushel to acre); 2cwt. Japanese superphosphate. Yield, $42\frac{1}{2}$ bushels = $21\frac{1}{4}$ bushels per acre marketable wheat.

Plot 2 (two acres).—Two bushels Sullivan's Early Prolific (one bushel per acre); 3cwt. Japanese superphosphate and sulphate ammonia. Yield, 46 bushels = 23 bushels per acre.

Plot 3 (two acres).—Two bushels Sullivan's Early Prolific (one bushel per acre); 3cwt. Japanese superphosphate and muriate of potash. Yield, 45 bushels = 22½ bushels per acre.

Plot 5 (one acre).—One bushel per acre Jade; 90lbs. superphosphate. Yield, 24¾ bushels.

Plot 4 (two acres).—Two bushels Sullivan's Early Prolific (one bushel per acre); *without fertiliser.* Yield, 28 bushels = 14 bushels per acre.

Plot 6 (one acre).—One bushel Lawler's Spring; 90lbs. superphosphate. (New ground.) Yield, 18½ bushels.

Remarks.—Jade is undoubtedly best wheat for this ground, as yield will show, and perfect hay wheat. Actual yield much greater, as per my letter; estimate six bushels per acre lost. Marketable wheat only calculated in all plots.

THE HOG LOUSE.

Suggestions for Prevention and Extermination.

United States Department of Agriculture: The hog louse is the latest representative of its family, and as the generic name indicates, is a blood-sucking parasite. The female attains a length of 6mm. (one-fourth inch). The male is smaller than the female, and is readily distinguished by the dark streak along the ventral median line of the last three abdominal segments. The division of the body into head, thorax, and abdomen is distinct.

Head.—The head is narrow, elongated, and rounded at the anterior end. The conical unjointed haustellum or proboscis is very prominent, and about the middle of the lateral margins of the head are situated the slender, filiform, five-jointed antennæ—one on each side. Each joint of the antennæ has a dark brownish ring about its middle, the distal joint often being entirely fuscous, and bears on its extremity a tuft of hairs or bristles. The eyes are flat and of a pale bluish colour. They are located posterior and dorsal of the base of the antennæ, and are very conspicuous.

Mouth Parts.—The mouth parts are of particular importance in the present connection, as it is due to their action that the irritation and inflammation of the skin occurring in infested hogs is produced. They are also of interest in view of the possibility that certain diseases, such as hog cholera, may be transmitted by the hog louse.

When a hog is badly affected with lice hundreds of eggs will be found on the hair back of the ears, along the front of the shoulders, and on the flanks. The freshly deposited egg is bluish white in colour, elongated oval in shape, 1·5mm. long, and is enlarged at the end bearing the circular operculum, or lid, which is forced open when the young louse is ready to hatch out. The egg is attached at its smaller end to the base of the hair by a gluey substance that usually completely encircles the hair. The surface of the egg is covered with small hexagonal punctations, which give it a honeycomb appearance. The shell of the egg is perforated by numerous stomata.

Incubation.—It is stated in Coburn's *Swine Husbandry* that the egg will hatch out in about five days after being deposited. Tests conducted at Washington, D.C., however, show that the time of incubation will vary with changes in temperature and moisture. It was found that eggs freshly deposited and kept in a room of ordinary humidity at a temperature of 85 degrees F. during the month of September hatched out in from 15 to 16 days, while the eggs placed in a close dish containing a receptacle filled with water hatched out in 12 days. Lowering the temperature retards development of the eggs.

It seems necessary to emphasise this part of the subject since usually little attention is given by farmers to this parasite. Every farmer and stock raiser is familiar with the frequency and wide distribution of the hog louse, but they do not always attribute to it any pathologic or economic importance. When a drove of hogs is not thriving properly the more common custom is to pronounce them out of condition, or simply off feed, and a patent stock food or a patent condition powder is administered, with no evident benefit. In such cases, if a careful examination of the animals is made, the cause of the unthrifty condition is often directly traceable to the presence on the skin of large numbers of lice or other external parasites.

When lice increase to large numbers, as they are likely to do if not destroyed, the skins of the animals become covered with scales and sores, and in extreme cases swelling and inflammation develop as a result of the parasites piercing the skin with their mouth parts hundreds of times each day in their efforts to secure blood for food. The irritation thus produced is a source of constant annoyance and worry to the hogs, evidenced by their restlessness and incessant rubbing and scratching against any convenient object. The ultimate effect of such affliction is seriously to interfere with the growth and fattening of hogs, especially of young pigs.

Lice not only produce a direct injury to hogs by impairment of the skin, but also, by reason of the debilitated condition of the animals which ensues, indirectly create a greater susceptibility to various diseases. It is stated by Peters of the Nebraska Experiment Station that observations in his work show that during epidemics of hog cholera animals affected with lice are most susceptible to the disease, and that the percentage of fatalities is greater than among herds free from lice. So evident is this that the first treatment he recommends for hog cholera is to destroy the lice on the animals and disinfect the pens.

The opinion that the hog louse may carry the infection of hog cholera from sick to healthy animals is not without support among some writers on diseases of hogs. Dodge quotes abstracts from correspondents referring to worms and lice causing hog cholera. No positive evidence or experiments have been brought forward, however, and the possibility of the hog louse conveying disease is an open question.

The destruction of this parasite is a comparatively easy matter, and practical tests have demonstrated the economic importance of freeing hogs from a pest that deters growth, weakens the general physical condition, and renders the animal an easy prey to contagious maladies.

Any treatment to prove effective against lice on hogs must include preventive measures as well as destructive remedies. The sleeping quarters of lousy hogs become infested with lice, which crawl off the hogs and secrete themselves in the crevices of the building and in the bedding, while the eggs on the hair that the hogs shed and rub off will hatch out young lice. These parasites in the building immediately reinfest animals from which the lice have been removed by treatment. The selling and slaughtering of the majority of hogs at a comparatively early age, and the consequent destruction of the lice on them in the scalding vat, is naturally a great check to the increase in the number of the parasites. As a usual thing, however, an entire herd of hogs is not sold at one time, and the few remaining animals will serve as hosts for the lice in the building until a new drove of hogs is placed in the same pens, when the lice at once begin to multiply rapidly on their new hosts. A thorough treatment, therefore, includes the destruction of the lice in the buildings and pens in addition to treatment of the animals themselves. If the pens where lousy hogs have been kept are left vacant for a period of two weeks all lice will have perished, and any new animals introduced will be in no danger of infection.

For disinfection of buildings, Peters gives preference to a 3 per cent. solution of any of the coal-tar preparations, to be applied with a broom or spray pump. Probably the most convenient method of combating lice and mites in buildings is the common custom of applying whitewash made by slaking lime with water ($1\frac{1}{2}$ pounds to one gallon of water). Popular usage has made this a standard remedy, for it has been found to be effective. Crude carbolic acid added to the whitewash (one pint of the acid to four gallons of whitewash) is said to increase its effectiveness.

In treating hogs infected with lice special attention should be given to those parts of the body where lice congregate in greatest numbers. They are found principally inside, behind, and in front of the ears, on the breasts, and back of the fore legs. Even with the most thorough treatment, however, some of the lice are apt to escape, and these, if not destroyed, soon increase in numbers. The eggs are not all destroyed by any single treatment. These facts make it necessary to repeat any treatment used in order entirely to eradicate these pests from a badly infested herd. When strange hogs are added to a herd they should always be examined for parasites in order that any infested ones may not cause the spread of lice throughout the entire herd.

Kerosene emulsion is prepared according to the proportions in the following formulæ:—

(*a*.) Hard soap, half-pound (one-half bar common soap); kerosene, 2 gallons; water, 1 gallon.

Boil the water and soap until the latter is dissolved, remove from the fire, then add the kerosene and churn or agitate vigorously till an emulsion is formed. This emulsion, if thoroughly mixed, will form a gelatinous mass

on cooling; it keeps indefinitely, and may be used at any time by diluting with warm water to 20 gallons. If used after cooling, the mixture should be heated again (great care must be exercised in heating a second time because of the inflammable kerosene present, and for safety the mixture should be heated out of doors), and then thoroughly mixed a second time.

(*b*.) Soft soap, 1 quart; hard soap, one-quarter pound; kerosene, 1 pint; water, 2 quarts.

Mix as in preceding formula, and dilute with 1 gallon of warm water. Reheat as in formula (*a*).

(*c*.) Sour milk, 4 gallons; kerosene, 2 gallons. Mix the milk and kerosene, and dilute with warm water to 20 gallons.

This formula has the advantage over other methods of making kerosene emulsion, as it avoids the necessity of making a soap mixture, the milk acting as an emulsifier.

(*d*.) Hard soap, one-half pound; pyrethrum, $3\frac{1}{2}$ pounds; kerosene, 2 gallons; water, 1 gallon.

Boil the water and soap until the latter is dissolved. Extract the pyrethrum with the kerosene by stirring the pyrethrum and kerosene together and allowing the mixture to stand for twenty-four hours; then pour off the liquid. The kerosene extract is then mixed with the soap solution as in formula (*a*). For use dilute with warm water to 20 gallons. Reheat as in formula (*a*).

The pyrethrum is said to add to the effectiveness of the emulsion.

The kerosene emulsions when prepared should not have oil drops rising to the surface. If drops of oil are seen it is proof that the emulsion has not been sufficiently churned or agitated to emulsify the mixture.

Goff describes and figures a spraying pump for mixing kerosene and water, which mixture is said to be more penetrative than an emulsion. This pump is fitted with a foot-valve admitting oil and water through separate orifices and a graduated screw regulating the proportionate amount of each fluid admitted. The packing and pistons should be made of leather and the valve seats of brass, on account of the destructive action of the liquid on fittings made of other material.

Benzine emulsion.—Soft soap, 4 parts; water, 10 to 15 parts; benzine, 1 part. Boil the water and soap until the latter is dissolved; remove from the fire, then add the benzine and agitate till an emulsion is formed.

THE GIANT BEES OF INDIA.

SAID TO BE GREAT PRODUCERS OF WAX.

Farmers who keep a few colonies of bees to supply honey for home use, as well as others who keep many for profit, will be glad to learn that the American Government is about to establish a model apiary at the Arlington experiment farm across the Potomac from Washington. Various races of bees are to be kept for experimental purposes, and among these will be the so-called "giant bees" of India, which for the first time will be imported into this country. These bees are much larger than the little workers to which we are accustomed. They are plentiful in India, but have never been domesticated. One article of considerable export from that country is wax collected by the natives from the trees or rocks from which these giant bees suspend their great combs. One may see tons of it stored in the warehouses of the seaport towns.

The natives appear to be afraid of this bee, and tell wondrous tales of its ferocity, and how in swarms they attack people, large numbers of them collectively, never stopping until they sting all to death; yet facts scarcely bear such stories out, as professional bee hunters go after the honey with no protection against their stings, and by stratagem of the most ordinary sort secure these great combs and come off safely.

Whether they can be domesticated in this country remains to be seen. It is the worker bee that is so large in the species, the drone being, but little, if any, larger than our common bees. It is hoped that at least we may get a profitable cross from the giant bee, as their tongues are long. So many of our flowers, and the red clover as well, secrete the sweet drop far out of reach of our honey bees.

This Government apiary will be a breeding station of the various races of bees. Queen bees of Caucasian, Cyprian, Dalmatian, Italian, and Carniolian races will be specially imported for propagating purposes.

Of late years, science has taken up the business of improving the honey bee, particularly in the respect of its honey gathering and gentleness of temper. Present day beekeepers select their bees as carefully as farmers do cattle. The Cyprians which hail from the Isle of Cyprus, are wonderful honey getters, but rather cross. The Italian bees are docile, easily handled, and also a profitable bee.

It isn't widely known that bees are not native to this country. It is claimed that bees were unknown in this country until in the seventeenth century, when the black bees were brought over from Germany. These are our most common bees and are savage and vindictive little rascals difficult to manage.

In Central and South America there are stingless bees. They are cousins of our honey bees, being grouped between these and the bumble bees.

These stingless bees make an excellent honey, but not so sweet as our honey bees make. They have been domesticated so long that history does not record it. These bees are kept anywhere, in jars, wooden cages hung on the verandahs, anything to which they can attach little bags of wax as large as pigeon eggs, and in these little wax bags they secrete the honey. You see, they do not build in hexagonal cells as our bees do. They bring from the flowers a special flavour to the honey they make, and the fragrance of spices and flowers. They cannot, so far, be introduced into this climate.

Beekeeping as an industry is on the increase. Four bordering countries in one State sent out no less than 4,000,000 pounds of honey. The raising of queens is also an industry. One Texas woman sells more than 2,000 of them in a year.

For raising queens, miniature hives are used. In these are put a bit of honeycomb containing one queen cell and a handful of bees to take care of the coming queen. An ordinary hive will produce many queen-bearing cells in a season. It is an easy task to detach these from the brood comb and raise them in the manner described. Queen bees propagated in this way are shipped everywhere. They go in a little wooden box, about four inches long, with one compartment for the insect and another for the candy upon which it is kept alive on the journey.

SWINE ERYSIPELAS.

The symptoms of the contagious disease of swine caused by the bacillus of swine erysipelas are as follows:—

In acute cases the swine show the usual signs of severe illness in the pig, viz., rise of temperature, shivering, loss of appetite, and vomiting. In such cases a fatal termination may take place in twenty-four to forty-eight hours, but frequently the animals live much longer. In the less acute cases a red patchy eruption from which the disease gets its name—Erysipelas—appears on the buttocks, thighs, body, and ears.

The breathing is very quick, and the swine stagger about when made to walk. Ultimately they lie prostrate in the litter and die comatosed.

In mild cases the general symptoms are not marked; the swine appear to be out of sorts, and show the usual skin eruption.

Animals which have apparently passed through the acute stages of the disease may remain unthrifty for a long time. Sometimes they die suddenly from disease of the heart, which is not an uncommon sequel of the disease. In other cases they present symptoms of lameness, due to trouble in the joints.

The skin is discoloured by livid patches, as in swine fever, but sometimes the only symptoms shown are those of nettle-rash. The bacillus, apparently, can flourish for a long time outside the bodies of animals, so that once the disease is introduced into insanitary sties the infection tends to remain there. For some reason, however, which is ill understood, the disease may assume a very mild form for a time, then burst out acutely. In Great Britain the acute forms have been observed particularly in the warm months.

Post-mortem.—The membranes of the stomach and intestines show red patches and are often swollen. The intestinal glands on the membrane are red and enlarged; sometimes the surface over these glands is abraided, but the distinct ulcer of swine fever is never seen. The lymphatic glands throughout the body are swollen and red. The spleen is often enlarged.

The membraneous coverings of the lungs and heart show red spots, and sometimes fluid is present in the chest and heart sack. The lungs are congested.

In the chronic form, one often finds that the tissues around the opening between the chambers of the heart, particularly on the left side, are thickened and rough; that is to say, endocarditis is present.

Prevention.—This is a disease against which several methods of protective inoculation have been directed. As far back as 1882, Pasteur and Thuillier prepared an attenuated virus by passing the microbe in series through rabbits. Two vaccines of different strengths were employed with an interval of 12 days. The inoculations are made under the skin inside the thighs at the dose of one-eighth c.c. The immunity takes about a month to establish itself, which is, of course, a serious objection to the method. It is advised that the operations should be as far as possible performed on pigs under four months, as they present more resistance. The immunity is said to last about a year. This is sufficient for feeding purposes, but it means that the inoculation requires to be performed annually on animals kept for breeding. The method has many serious disadvantages. It may give rise to fatalities. The statistics from Hungary, collected on about 4,000,000 observations, put these at 1·68 per cent., against a calculated death rate of 20 per cent. in the non-vaccinated.

In France, however, the results have not been so happy. In certain cases a loss of 10 per cent. has been recorded, in addition to such sequelæ as arthritis (inflammation of the joints), and emaciation. The high percentage of losses is said to take place only in districts where the disease is established, but these, unfortunately, are the very places where one would wish to employ inoculation.

Lorenz, recognising the shortcomings of the method, devised another in 1863. This consisted in the preparation of a serum by injecting protected pigs with large doses of cultures. The pig, however, is not a good subject for the preparation of serum. In order to get sufficiently active material, the immunising bodies had to be precipitated by sulphate of ammonia. At the seventh International Veterinary Congress, Lorenz, in common with Leclainche and others, admitted that the horse was best suited for the preparation of a serum against swine erysipelas. A horse can be prepared in about two months. The immunity conferred by the serum alone begins

immediately, but it lasts for little more than ten days. It apparently has protective properties even when used in the initial stages of infection.

Leclainche advises that where the disease has already broken out, the pigs should receive a preliminary injection of serum, 10—20 c.c., according to weight. This, he says, greatly reduces the number of accidents consecutive to vaccination proper, which is performed about ten days afterwards. The first operation is with a mixture (made on the spot) of serum—1 c.c. per 20lb. live weight with a minimum of 5 c.c. and a maximum of 10 c.c., and ·8 c.c., of a culture. Twelve days later the animals receive ·8 c.c., of a culture without any serum. The injections are made subcutaneously either at the base of the ears or inside the thighs. During a period of 18 months ending November, 1801, over 24,000 pigs were thus inoculated without accident. About one-half of them were treated by preliminary injection of serum.

In the first method of Lorenz serum was administered three days or so before the culture, which was made with somewhat attenuated bacilli obtained from the chronic lesions. This was followed twelve days afterwards by a double quantity of culture. Later, Lorenz combined the injection of serum and first vaccine, but inoculated them at different parts of the body. In 1898, 22,161 pigs were inoculated by Lorenz's method in Eastern Prussia, of which 3,831 were on infected farms. In the latter there were no fresh cases of swine erysipelas after inoculation; 58 per cent. of recoveries were recorded in sick animals after the injection of serum (alone) (1—4 doses). Nettle-rash occurred in ·04 per cent. of the inoculated; the disease disappeared from the farms after inoculation was adopted; whereas it had reappeared regularly before that time.

In Wurtemburg in 1896-8, 17,758 pigs were inoculated. The accidents numbered thirteen; the deaths certified due to this disease (*i.e.*, failures to protect) were sixteen (ten cases doubtful); 3,254 non-vaccinated died of swine erysipelas.

It is not advisable to resort to inocculation of pigs on non-infected premises unless the circumstances are such that owing to the proximity of acute outbreaks it appears practically impossible to prevent the disease being introduced by methods of rigorous isolation, because the operation might possibly be the means of infecting the premises. Should the disease appear, however, all the pigs should, with the least delay possible, receive a dose of serum, and those in which the temperature is normal should be removed to non-infected sties on the same premises, if this be practicable. Ten days afterwards the vaccination proper may be practised after the method of Leclainche (serum and virus, then virus alone) on those animals still showing a normal temperature. The pigs with high temperatures should be returned to the infected sties, and if their value warrant it, they should be treated by injections of serum alone. On no account should they receive the culture. If it be found impossible to separate the sick from the healthy, the operations should be carried on in the infected sties. Although this disease can to a large extent be successfully combated by serotherapy, it must not be thought that measures of isolation and sanitation can be dispensed with. While the outbreak lasts, no new pigs should be brought in, and none should leave the premises except for slaughter, under the most rigorous precautions against the disease being conveyed to other premises. If a pig

owner finds that the disease reappears annually on his premises he should resort annually to preventive inoculation, timing the operation so as to have his animals immunised before the season of greatest activity. He should also remember that the complete eradication of the disease from his premises will be greatly facilitated by keeping his pigs in sties which can be properly disinfected.

CANTERBURY (N.Z.) SHEARING AGREEMENT.

The following is the shearing agreement adopted by delegates of the Canterbury Sheepowners' Union and the Canterbury Shearers' Union, and submitted to the Arbitration Court for approval as an award of the Court:—

1. That the shearer shall shear with all reasonable despatch the sheep the employer or his agent require him to shear, the approximate number of which shall be agreed upon between the employer or his agent and the shearers' representative before the commencement of shearing, in good time, and workmanlike manner, and to the satisfaction of the employer or his agent.

2. The hours of shearing shall be from 5 a.m. to 5 p.m., or from 5·30 a.m. to 5·30 p.m., with intervals for meals and smokes as shall be mutually agreed upon by the shed manager and the shearers' representative. Shearing to stop at 4 p.m. on Saturdays, except in the case where 48 hours and 20 minutes' work has been done before noon, in which case work may be stopped then. When shearing wet ewes, the shed manager may alter the smokes and extend the hours to the extent of half an hour, in order to complete a cut-out.

3. The price for shearing by machine to be 16s. 8d. per hundred, with rations; price for hand shearing to be 17s. per hundred, with rations. In cases where shearers find themselves, the price to be at the rate of 3s. 4d. per hundred extra; the rate for stud sheep to be as per arrangement.

4. That the price for shearing hogget rams be rate and a-half; other rams double ordinary rate.

5. Once in each week, on a day to be named by the employer or his representative at the commencement of the shearing, the employer shall, upon the request of any shearer, pay to such shearer, or his order, any sum not exceeding 75 per cent. of the net amount then due to him. Such money may be paid by cheque or by order, and if such cheque be not upon a local bank, exchange shall be added; a cheque required by a shearer in order to be sent to the place on which it is drawn shall be deemed a cheque on a local bank.

6. All sheep shorn shall be paid for in full, subject to payments already made, and to sums due to the employer, at the end of the shearing; provided that a shearer or his administrator shall be paid on the termination of his employment if it shall have terminated through his death or illness, or illness in his family, or any similar or urgent cause.

7. That no shearer be compelled to shear cancered sheep.

8. That the employer shall have full control of his shearing operations, except in matters provided for in this agreement.

9. That a representative be elected by the shearers; such representative and the person in charge of the shed to be the responsible persons to settle disputes. In the event of a dispute arising as to wet sheep, the shed manager may take a vote by ballot, the persons entitled to vote being the shearers, with the exception of the shearers' representative (who shall not vote except in case of a tie), the shed manager, and wool-classer; the majority to rule. Provided the owner, in case he considers the sheep too wet, shall be at liberty to turn them out.

10. That no shearer enter a catching pen after the bell rings.

11. All sheep shall be taken carefully from the catching pen, and no sheep shall be legged out unless with the permission of the person in charge of the shed. No shearer shall kick or ill-treat any sheep. In case a shearer turns out a sheep badly cut or insufficiently tarred, he shall at once sew and tar such wounds in his pen, or otherwise treat or dress the sheep, as directed by the person in charge of the shed, but no shearer shall be required to tar his sheep in other cases. When a sheep is seriously cut, or otherwise injured, the shearer shall immediately report the fact to the person in charge of the shed.

12. That the employer find free grazing for one horse for each shearer.

13. That the employer finds, free of cost, one grindstone to every eight, or part of eight, shearers.

14. That in sheds where machines are used, the employer shall find the necessary machinery and oil; the shearers to pay for combs and cutters at cost price.

15. That sufficient food of good quality be supplied to the men by the employer, such food to include butter; not more than one pound of butter per week to each shearer.

16. That the dining-room be sufficiently lighted each evening till nine o'clock.

17. Any person absenting himself from work without leave, or without proper reasonable grounds, or found bringing intoxicants on to the station, may be treated by the employer as having committed a breach of this agreement.

18. No employer shall, in the engagement or dismissal of men, discriminate against members of the union, nor do anything for the purpose of injuring the union, whether directly or indirectly. Provided that nothing in this award shall interfere with the right of the employer to discharge any shearer at any time for such incompetence or misconduct as would justify such discharge under the general law.

19. When members of the union and non-members are employed together, there shall be no discrimination between members and non-members, and both shall work together in harmony, and shall receive equal pay for equal work.

20. Where the sheep-owner engages a contract cook, provisions of Clause 15 shall apply.

21. This agreement to remain in force until March, 1908.

THE RABBIT-PROOF FENCE.

Important Recommendations.

Mr. Day inspected 800 miles of fencing, and formed the opinion that the fences were well constructed and maintained, and were as absolutely proof against any influx of rabbits as it was possible to make them. In his opinion a thoroughly efficient fence could have been erected at a considerably less cost by lengthening the panels and eliminating the bottom wire. The construction, however, he states, is on the safe side.

Referring to the hanging of the netting, Mr. Day approves of the putting of the netting 6in. down straight from the surface, instead of doubling up and putting as a flange on the outside, as has been repeatedly advised. In the latter method he considers there would be considerable danger in light sandy soil of the bottom of the netting being laid bare through drift, and the rabbit thereby being afforded an excellent opportunity of burrowing under the fence. With regard to the posts, he considers that they might have been sunk a distance of from 18ft. to 20ft. apart without interfering with the efficiency of the fence. The timber used was good and substantial, with the exception of the salmon gum, which might possibly be affected by the white ants. The gates, he thought, were good ones, and in most cases well hung. They were, however, unnecessarily substantial. He recommends that all metal approaches to gates should be thoroughly blinded and rammed, so as to preclude the possibility of stones getting jambed between the gate and the sill, thus leaving an opening for the rabbits to get through. He was also of opinion that the gates to the south of Burracoppin were absurdly small, and too far apart. He recommends that more gates be erected of a size sufficiently large to allow a horse team and waggon to go through.

Referring to the flood gates, he points out that the danger from flood south of the Eastern railway line was practically *nil*, but that between Yalgoo and Nannine, and possibly in other places not inspected, the fence

was intersected by numerous creeks and shallow watercourses, and in time of flood they would prove a constant source of danger. The principle adopted in South Australia, he states, where creeks and watercourses crossed the fence, was, instead of erecting flood-gates, to erect an independent piece of fencing across the watercourse with the netting attached on the down-stream side of the fence, first taking care that the water was diverted into as narrow a channel as possible. When the flood came the netting was washed down, possibly the whole piece of the fence, across the watercourse, but that did not affect the main fence.

He thought the flood-gates adopted here were good, but what appeared to him to be a source of danger was that the gates were simply hung on to a twisted galvanised wire erected above the water level, the idea being that as soon as the flood came down and the debris collected against the netting the weight of the debris and water would straighten out the wire hooks, and the gate would fall right down, and be only held at the bottom of the creek. This had been found to work satisfactorily, but the danger did not arise from the floods, but from the emus and kangaroos that rushed the fence when there was no flood.

Another objection to flood-gates was that, although the posts in the watercourses were put down in some places 4ft., and packed in with stones and rubble, they would not stand the combined rush of water, his experience being that the constant swirl round the bottom would soon wash out any post, no matter how well erected. In any case, he was of opinion that the flood-gates would have to be much more securely fastened than at present. Another defect which Mr. Day noticed in this connection was that in many cases, instead of the fence crossing the creeks at right angles, they crossed at a very acute angle, It had, he stated, always been found wise to make the length of fence liable to damage by flood as short as possible.

The traps erected along the fence were, he considered, satisfactory, and the only improvement he could suggest was that the bottom of the bugles or funnels should be right on the ground and some earth sprinkled in, in order to quite cover the netting on the bottom of the bugle, and thus make a firm pad for the rabbits to walk on. He also recommends that between the wings of the traps some low scrub or herbage should be allowed to grow, in order to make the traps less conspicuous to the rabbits.

Rabbit Destruction.

In dealing with the question of rabbit destruction, Mr. Day first briefly touches on what has been done in the Eastern States, and refers to the finding of the Royal Commission appointed to investigate the various schemes put forward for the extermination of the rabbits as a result of an offer by the New South Wales Government of £25,000 bonus to anyone who could successfully demonstrate such a possibility, that no finality in rabbit destruction could be obtained without making the erection of rabbit-proof fences compulsory.

In regard to the destruction of rabbits between the two fences, Mr. Day prefaces his recommendation in this connection by the remark that he fully realises the heavy expenditure which would be involved, but at the same time he feels certain that unless some very prompt and drastic measures are

taken, in a very short time the area will become infested beyond the hope of its ever being practically cleared of vermin. His recommendation is as follows:—

That a sweeping movement be initiated, comprised of two parties of rabbiters, say 20 in each party, to be spread along each side of the railway line, one party working north and the other south, each party to be in charge of two overseers, whose duty it would be to scour the country ahead of their parties and direct the operations of the rabbiters. To do this it would be necessary to have proper equipment of camels and drivers, or other means of transport, to carry water and shift camps, each party to be supplied with poison, traps, and dogs. If good men were employed, and the overseers were thorough bushmen, Mr. Day had no doubt splendid results would follow. It would also be necessary to arrange for every settler within the area to co-operate with the Government parties in the movement. Mr. Day estimates that it would take three months to accomplish the action, and the cost would be about £5,000.

Of the methods of destroying rabbits generally adopted, phosphorised pollard is recommended by Mr. Day as being the most effective, and one of the cheapest. Strychnine and arsenic are also recommended as very useful for poisoning twigs and water, the latter placed in troughs along the fences and supervised by the boundary riders. Cyanide of potassium is also stated to be good for poisoning water. The I.X.L. poison cart is also strongly recommended for the use of boundary riders and rabbiters. Three of these carts have already been ordered, but have not yet been received.

Maintenance of the Fence.

The question of the maintenance of the fences Mr. Day considers one of the most important, and emphasises the necessity for the employment of trustworthy and reliable men for the work, and mentions in this connection that one of the greatest safeguards to the efficiency of the fence is the destruction of the vermin that come on to it. With the exception of the 463 miles of fencing erected by contract No. 1, he found that the average length allotted each boundary rider was about 50 miles, and this, in his opinion, was a fair length for each man to look after, but on the 463 miles there were 14 boundary riders at £208 per annum, each having an average length of fence of 33 miles, which, in his opinion, was certainly not enough for each rider. Nine boundary riders would, he thought, be quite sufficient, more especially as this fence was practically free from watercourses. He considers that if the boundary riders inspect the whole of their line twice a fortnight that ought to be sufficient.

Mr. Day recommends that a chief inspector be appointed with four sub-inspectors under him, each sub-inspector to be given charge of a district, and his duty to be not only to see that the fence is kept in proper order and condition, but also to deal with the destruction of rabbits in his district, and have control of the trappers working in the district.

Mr. Day suggests that the Government could recoup themselves for the expenditure by a tax upon the land. To pay it off in 20 years, including interest, the rate would be £7 7s. 2d. per £100, interest reckoned at 4 per cent., or at the same rate of interest in 42 years, at £4 16s. per cent., per annum. Mr. Day has worked out a number of tables showing how this tax

can be levied, and what it would cost per 1,000 acres in various districts, the cost varying from 2s. 6d. to 19s. per thousand, according to the district and the amount of land held in it. The total cost of maintenance, exclusive of the departmental salaries, Mr. Day works out at £120,000 per annum, or £6 a mile per annum.

Administration.

The present Act in operation, Mr. Day considers, requires amendment in some important particulars. One is the definition of barrier fences (section 3), especially with reference to sections 41 to 43. It was, no doubt, he points out, intended to make rabbit destruction compulsory between the two fences, therefore it is necessary to remove the liability anyone is under who has a rabbit in his possession anywhere within this area. At the same time, he thinks a clause should be inserted making it a criminal offence for anyone to liberate or attempt to liberate any rabbit, and he would also recommend that it be an offence to even keep rabbits in enclosures. As regards compulsory rabbit destruction, Mr. Day thinks that if this be necessary it is only right that the Government should accept their position as occupier of the Crown lands, as it would not be fair to compel the private landowners to destroy rabbits while on the adjoining Crown land nothing was being done to reduce their numbers. It is also suggested that advances for wire netting should be done through roads boards. At the present time anyone wishing to obtain an advance of wire netting from the Government has to mortgage his property; this adds to the expense of the transaction. Mr. Day points out that by an alteration in the Act this advance can be made a first lien on the land, taking precedence over all ordinary mortgages, thus saving expense to those wishing to obtain wire netting without reducing the value of the security. Mr. Day further recommends that the Act be amended to allow of the use of 18-gauge wire netting in lieu of 17-gauge, which would reduce the cost per mile considerably.

It is suggested that all police constables in the country should be authorised persons under the Act, and should investigate any report as to the presence of rabbits, and then communicate the result to the Rabbit Department.

Also, that the Government should supply poison for rabbit destruction at cost price, or, in badly infested areas, if necessary, supply poison to those who cannot afford to purchase for themselves.

Mr. Day strongly deprecates the opening up of reserves along the fences to public traffic, and suggests that any infringement of this rule should be severely dealt with.

FIG. 5. CARTING GRAIN AT "TIPPERARY," YORK.

THE MINISTERIAL VISIT TO THE NARROGIN DISTRICT.

The Director of Agriculture, Mr. C. Chaplin, who accompanied the Hon. the Minister for Lands, Mr. N. J. Moore, M.L.A., on a tour to the Narrogin District, has furnished the following report of the visit:—

"Arriving at Narrogin, the Minister's party was joined by the Surveyor General (Mr. Johnston). The president of the local Agricultural Society (Mr. Weise) and several of its members welcomed the Minister, and a move was then made to the State Farm, four miles distant. Although the land embraced by the farm is probably about the

Worst in the Neighbourhood,

we have reason to believe that under our improved methods it can be brought into much-improved fertility. It would seem that those who originally chose this area for a State farm had in mind the necessity of experimenting on the most inferior land, and thus eventually demonstrate how it was possible to make such material productive. We are clearing a further 200 acres, and this is probably the best soil on the estate. The clearing is being done by newly-arrived immigrants. Instead of allowing them to walk about the city just after arrival awaiting work, those desirous of taking to the land for a living, and to ultimately select land on their own account, are sent to Narrogin, where they receive wages commensurate with their earning capacity. They thus are afforded some training in farm-work, commencing with the clearing of the land. When more lucrative employment offers—a result which follows relatively on the aptitude of the men in becoming acquainted with the work—they are taken on by farmers. So far, those who have shown ability in the work have been successful in obtaining employment in the manner indicated. Of course, it is

Rough on the Officers

in charge, because they are continually meeting with the rawest of new chums, and although these are, generally speaking, willing to learn and to work, it is obvious that the continuous supervision of such raw material becomes irksome. However, we have arranged to have several experienced workers blended, so to speak, through the gangs. We have had a comfortable camp put up, and have provided a cook. The accommodation for this class of labourer is now equal to about 20, but with the erection of more tents this number can, of course, be increased. Notwithstanding that this method of qualifying our immigrants as settlers may cost the State a few pounds, it should not cost much, as their labour is worth, in most instances, at the outset a little more than their actual keep, and it is manifest that by such a means we shall be enabled to increase appreciably the number of our agriculturists—a result much to be desired at this stage in our development.

Some of these young men have means to enable them to take up land, but they are sensible of the necessity of learning something of the rural conditions obtaining here before expending their capital.

"A State farm is essentially an experimental farm, and under this head it should show the best means of making farming pay in a given locality. This is, after all, the only kind of experiment worthy to be brought within rural economics. Minor experiments in testing manures and various plants can certainly be carried on collaterally, but the main expedient is to make mixed or combined farming pay, and this should come foremost in such an institution as a State farm. Towards this end our efforts are to be directed. As to our methods, the Minister arranged, in the first place, with the Surveyor General to have a feature survey made of the Narrogin State Farm. The local Government surveyor (Mr. Moss) is to do this work. He is instructed to make

A Plan of the Estate,

marking the location of the buildings, experimental plots, orchards, cultivated and other paddocks. The several fields will be numbered, and a map showing all details furnished the Department. A duplicate map will be kept on the farm. A return, on a printed form, is made out now by the manager of the farm at the end of each week, and at once mailed to the head office. This return shows the work done for the week; the number of hands employed, and wages paid; the number of acres cleared, ringbarked, ploughed, and otherwise cultivated, etc.; the number of stock, showing increase or decrease by sales, etc.; and amounts received for stock and produce has to be on the return. The return also shows the paddock numbers in which the hands have for the week been employed. With this and other complete data, we can see at a glance every week what work has been performed. This does not call for any expensive system of bookkeeping, and it will be a constant check on the management of the farm. We shall have also under this scheme a reliable record of the results of crop rotation, the relative value of the various crops, and the improvement in the soil fertility so affected.

"It is our intention to experiment somewhat largely, during the present season, in dairying. In pursuit of this, an endeavour to lay down permanent pastures is to be made on the lines suggested recently in the *West Australian*. A quantity of the best known drought-resistant and deep-rooting grasses have been ordered from abroad. These will be mixed in a manner to provide a good percentage of the deep-rooting varieties. It has been found that the best subsoiler is the roots of plants, and we hope, by careful cultivation, to get the deep-rooters to go down where the moisture holds in summer, and thus permit their brethren of lesser rooting vigour to obtain a share of that moisture. This method has been known to secure splendid stands of nutritious grasses in very arid country, and there is no reason apparent why we cannot succeed in getting similar pastures in this locality. To carry on dairying, it will be also necessary to provide succulent forage, and this can be successfully done by means of ensilage. This class of fodder is being at present made at Narrogin, with good results. We may, however, sow a fairly large area of such a combination, probably, as rye, tares, etc., for ensilage-making. It has been found, from actual experiment, that the bulk of the

Ration for a Dairy Cow

as well as the palatability and digestibility must be regarded. There must be sufficient bulk to distend the stomach, and this for milch cows may consist largely of straw, which is partially digestible and usually palatable. Food too concentrated in character, though supplying the requisite nutriments, causes an uneasy and unsatisfied feeling, and less milk. When dairying becomes general and mixed farming is added to ordinary cereal-growing, the value of wheaten or oaten straw will be exemplified in the universal use of the reaper and binder in lieu of the stripper or harvester. We intend to instal a milking plant as a test during the year, and if this prove a success the labour difficulty, to a great extent, will be met. There are many farmers in the vicinity of the Narrogin State Farm who contemplate embarking on dairying, but they are awaiting the result of our methods at the farm. The question of marketing the product will have to be considered. If sufficient cows can be enlisted in the neighbourhood, the co-operative butter factory system may exert itself.

The Poultry Expert

will in future be located at the Narrogin Farm. In fact, this official should be in a position to give practical demonstration in producing poultry and eggs and showing the commercial value of the industry. An example given leads usually to better results and greater enthusiasm. The expert, while having his headquarters at Narrogin, can make his usual rounds of instruction, and be armed with better practical detail as the result of his continued experience at the farm. The day following our arrival in Narrogin," continued Mr. Chaplin, "a large party of the residents was arranged for to accompany the Minister over a section of the country lying to the eastward. Among those in the party were Messrs. Weise and Uren (president and secretary respectively of the Narrogin Agricultural Society), Clayton, Brown, Moss, Smalley, Hall, Cowcher, M.L.A., Edwards, Johnston (Surveyor General), Chas. Harper, W. G. Grasby, and many others. When 12 miles had been traversed a halt was made at a place named Wandering. Here quite a number of farmers had assembled to welcome the Minister and to place several requests of a minor character before him. The ladies were also in strong force, and had provided refreshments. In this vicinity the watershed which forms the nucleus of the Swan, Hotham, and Arthur Rivers is situated. The average rainfall is given at as between 17in. and 18in. per annum. Numerous tributaries

Drain a Large Area

of the country round about here, forming the main watercourses referred to. The land which surrounds the heads of these rivers is probably equal, from the point of fertility, with any in the State. Continuing our journey for a further 13 miles, we arrived at the settlement of Boyning, or, as it is locally known, New Jerusalem. The country passed over is gently undulating, the indigenous timber growths being York and salmon gum, mallet, morrell, and jam. The soil which mainly overlies the granite is brown and sandy loam. The rocks in the neighbourhood consist chiefly of feldspar, quartz, and mica; and as feldspar is particularly rich in potash and soda and poor in lime and magnesia, there is probably a paucity of lime in the soil in many places. A certain quantity of phosphate of lime is, of course, added to the soil by means of the ordinary fertiliser, and good yields have resulted. It is certain,

however, that heavy dressings of lime, being as it is a medicinal agent in the soil, would have a remarkable effect on the yield of grain, or, in fact, on any crop. When we reached

The New Jerusalem

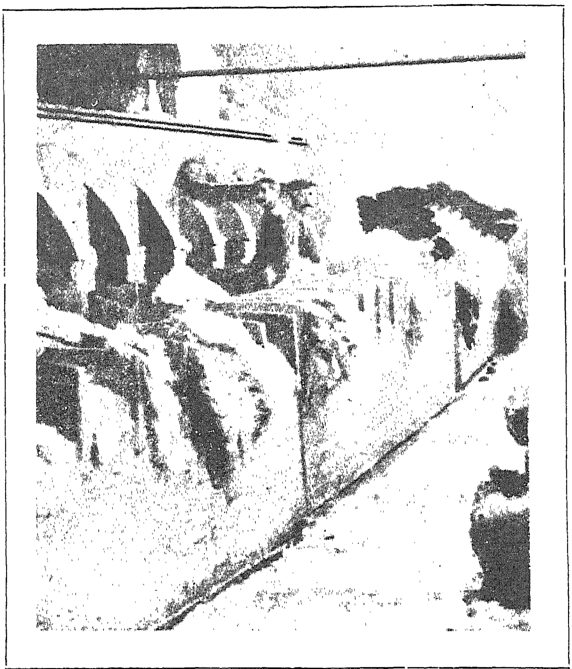
a great surprise awaited us in the shape of festivities. This settlement is unique in its ideas and conformation. About three years ago Mr. J. C. Fisher came from Victoria with some of his sons to select land in Western Australia. He chose the locality under notice, and returned to Victoria to dispose of his property there and to induce his friends and neighbours to do likewise and settle in Western Australia. Eighteen families, numbering in the aggregate about 61 souls, comprise the settlement. Nearly the whole of the people are related, in one way or another, and they all embrace the one religious faith. From what could be learned in conversation with many of them, it is this bond of faith and unity of spirit which cements, in a manner of speaking, that helpful brotherhood which in a comparatvely isolated region renders life more enjoyable. They belong to what is termed the "Church of the First-Born," or Christianised Jews. Mr. J. C. Fisher, the leader of the party, belonged originally to the ordinary Jewish religion, but became a convert to Christianity. The settlement contains about 10,000 acres divided into farms of from 500 to 1,000 acres. Each farm is held by the individual settler,

In His Own Right,

and its finance is controlled by the owner. No financial complications can arise under this scheme, as the real communistic principle in that respect is abjured. It was pointed out that the foremost plank in their platform was "love thy neighbour as thyself," and the logic of this is apparently not to have anything to do with the control of your neighbour's affairs beyond a general co-operation for the advancement of the social, moral, industrial, and political wellbeing of the community. In the social hall—which is also used as a synagogue—a crowded audience assembled to lay before the Minister the question of constructing a railway from Narrogin to the settlement. They made out a strong case, and the Minister was soon

At Home with Them.

It is self-evident that before any appreciable headway in agriculture can be made in these localities, railway communication must be given them. If the land is not worth a railway, it is not worth cultivating. The distance of 25 miles is too great from a railway, and farmers so situated cannot possibly make agriculture pay at all unless they resort, in the meantime, more to stock feeding. These people have set to work with a will, and this is evidenced by the fact that 3,000 acres have been cleared already. They deserve encouragement, for the State requires thousands of their class."



Scutching Mill, showing the Scutched Flax.

Cleaning the Flax Fibre. Hand Scutching.

THE FLAX INDUSTRY OF TO-DAY.

Of all the plants cultivated for fibre, flax, *Linum usitatissimum,* is doubtless one of the earliest, and we know of its existence from the times of the first authentic records. Even cotton, which was mentioned in the writings of Herodotus in 445 B.C., must take its place as a comparatively modern product with reference to its forerunner—linen. Because of this very antiquity, the origin of the flax plant is rather uncertain; but it is believed that it arose in the region between the Caspian Sea and the Persian Gulf. That it was cultivated and manufactured by the Swiss lake dwellers in the Stone Age in Europe is proved by the well-preserved specimens of straw, fibre, yarn, and cloth to be found in the museums. The ancient flax was, however, from another species *Linum augustifolium.* The Egyptians produced and used flax thousands of years ago, and the Chaldæans and Babylonians carried its use to the highest state of development, employing it particularly in tapestry work. Three thousand years ago the Phœnicians extended the culture, the Greeks and Romans made it a household industry, and it subsequently became the aristocratic fibre. It is claimed that the ancient Mexicans were acquainted with both flax and hemp, and their culture in that country goes back far beyond the earliest date of our civilisation. It was introduced in this country in Massachusetts as early as 1630.

While the plant can be grown in nearly every portion of the temperate world, flax is cultivated, primarily, for the production of fibre in central and northern Russia, in Holland, Belgium, Ireland, and northern Italy. In southern Russia, British India, Argentina, and the United States it is grown almost exclusively for seed production; in these regions the straw is used for fuel, stable bedding, and sometimes for forage. In a few localities in this country the straw is used for paper stock, or is made into upholstering tow. While the cultivation of flax for seed, and the manufacture of this into oil and oil-cake, have grown into industries of enormous proportions in the United States, only in a few vicinities is the plant grown for the production of spinning fibre. At Yale in Eastern Michigan, at Northfield and Heron Lake, Minn., and at Salem and Scio, Ore., the flax is cultivated for its fibre.

While flax was extensively grown and its fibre spun and woven during colonial times, it was used almost entirely as a home product for consumption in the families of the weavers, and it is probable that very little linen was manufactured for purposes other than this. While it is possible that after the successful termination of the Revolutionary war the industry would have grown to considerable importance in the hands of the American people, with the abolition of England's repressive colonial policy in regard to manufactures, the invention of the cotton gin by Eli Whitney checked its future development at once. This invention placed within reach of the manufacturer a fibre that was cheaper than flax, that required less care in preparation,

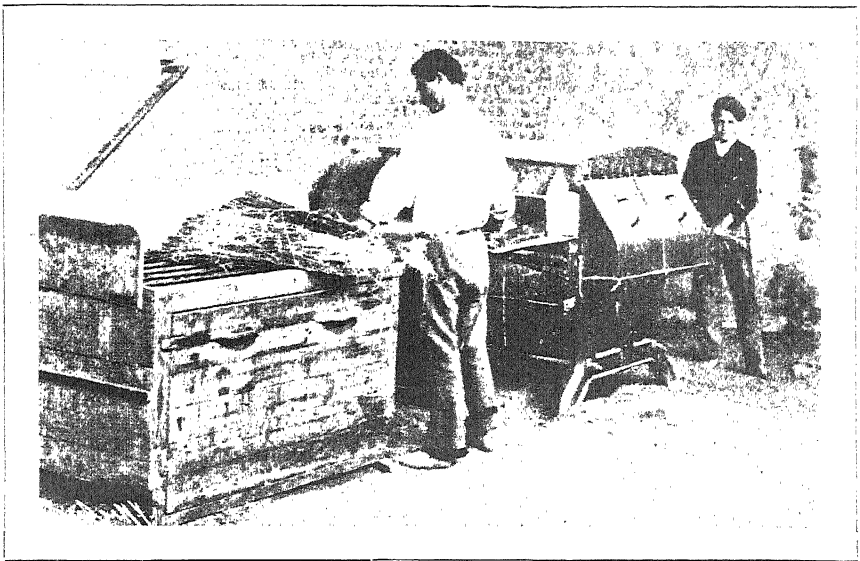
more easily worked, superior for many purposes, and decidedly inferior for very few, and in consequence the manufacture of linen was practically abandoned. Until within comparatively recent times the attempts to reintroduce it have been few and far between and generally unsuccessful. Additional reasons for this are found in the expenditure of time and labour entailed by the retting process, in the difficulty in spinning and weaving a fibre with as little elasticity as this, in the consequent precariousness of the margin of profit, and finally, in the fact that the demand for the finished product is not nearly as broad or general as is that for other textiles. Nevertheless, while the linen industry in the United States is not extensive to-day, a considerable advance, measured in percentages, has been made in the last ten years. There are certain fields, such as the manufacture of linen carpet yarns, linen thread for the shoemaking industry, towels and towelings, in which the American manufacturers should be able to compete successfully. They have already occupied some and entered into others of these fields, and the growth of the industry in other directions is generally prophesied.

Nearly all the flax fibre used in the United States is imported from Russia, Holland, Belgium, and Ireland, while a small quantity comes from Italy and Canada. A great deal of the so-called "Irish flax" is grown in Belgium and sent to Ireland for preparation. The flax grown in this country is usually from Riga (Russian) or from Belgium Riga seed.

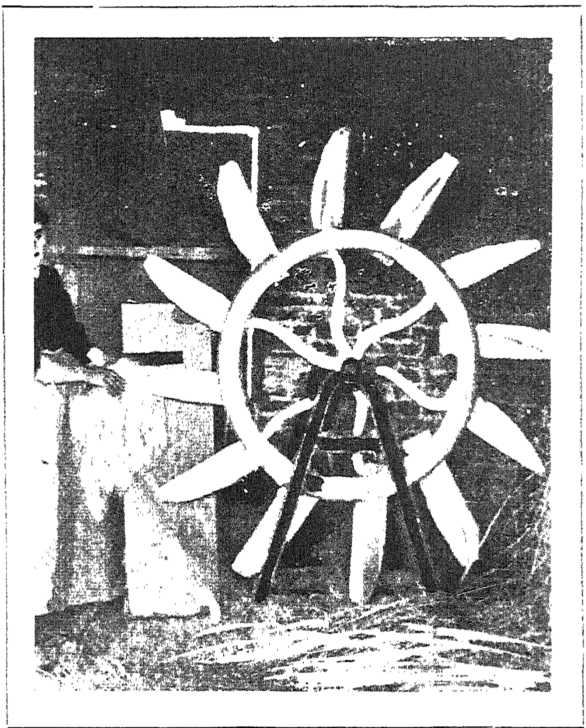
The culture of flax requires a deep, well-tilled soil in a high state of fertility. Wet soil such as some clays is disastrous to the crop. Similarly fatal are soils filled with the seeds of weeds. Moist, deep, strong loams upon upland in a fairly moist climate are especially favourable to the plant. The land must be deeply ploughed and thoroughly harrowed. Because of a disease, flax-wilt, it cannot be cultivated year after year upon the same ground; but as the other ordinary crops are immune from the spores which remain in the soil, flax may be introduced in a rotation once in six or eight years.

Flax is sown early in the spring, broadcast like oats or wheat, the seeds being spread evenly, at a depth of less than an inch. Though the root system is small, the growth of the plant is rapid, maturity being reached in about one hundred days. The crop must be thoroughly weeded, the operation beginning when it is about two inches above ground, as the quality of the plant when choked by weed is poor. The best flax is pulled out by the roots. This is done to avoid stain and injury, which would result from soil moisture while the cut stems were in the shock, to secure straws of the greatest possible length, to insure better curing of the straw and ripening of the seed, and to avoid the blunt cut ends of the fibre. The straw is often allowed to dry on the ground, and then to cure for two or three weeks in the shocks, though the practice varies somewhat in different countries. The seeds and leaves are removed by a process called *rippling*. This is done to-day by machinery, the heads of the unbound bundles being passed between rapidly-revolving corrugated rollers, which crush the seed pods. The seeds and leaves are then removed by means of a fanning mill. After this the straw is stacked until required for the retting.

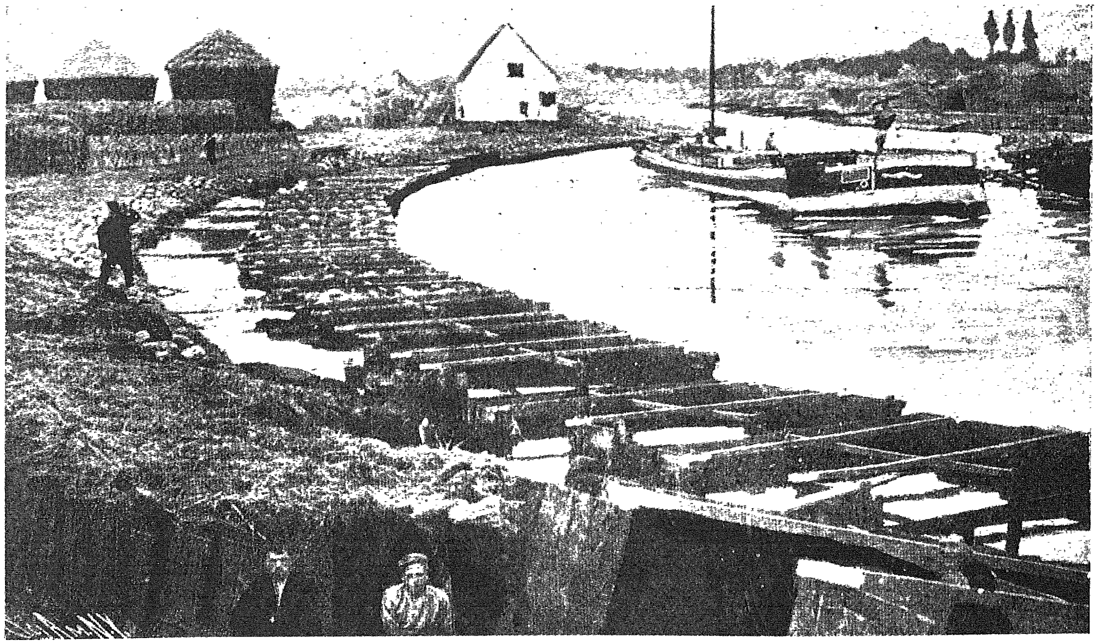
The flax fibres, which appear to consist of pure cellulose and show no signs at all of being lignified, are held together by an intercellular substance consisting mainly of calcium pectate. The object of the retting is to decompose or make soluble these woody tissues inclosing the cellulose or bast fibres, so that they can be removed from the latter by the subsequent processes.



Rippling Machine in Operation.



An Old-Time Scutching Mill.



Crates of Flax Weighted and Sunk in the River Lys

The water-retting of flax is a biological process induced by the action of definite organisms, the chief of which is an anaerobic *Plectridium*, which in the absence of air ferments the pectin substances of the cellular material, uniting the parenchymatous tissues, and thus causes a loosening of the bast fibres. The absolute exclusion of oxygen, which is necessary in order that the fermentation may be set up, is brought about by numerous oxygen-consuming bacteria and fungi. The products formed by the fermentation of the pectin substances are hydrogen and carbon dioxide and organic acids, especially acetic and butyric acid and small quantities of valeric and lactic acids. The injurious action of the acids produced, especially butyric, may be considerably diminished by adding alkali or lime to the retting liquid. It has been found to be advantageous to inoculate the liquid at the beginning of the retting with pure cultures of the anaerobic *Plectridium*.

On the retting process depends the quality of the linen, and it is that stage of the industry which presents the greatest difficulty. There are three methods which can be employed, and of these the simplest and least careful is dew-retting. The straw is simply spread evenly over the fields like hay to be retted by the action of the dew and the elements. The fibre resulting from this method is the most uneven and the least valuable product of the three processes. With the exception of that in use at Northfield, Minn., it is the process usually employed in this country. The second method, called pool-retting, consists in immersing the bundles of straw in stagnant pools, the softest waters, such as rain water, giving the best results. Holes are dug in the ground for this purpose, though a great part of the Irish flax is retted in "bog-holes." The resulting flax fibre is better than the dew-retted product and is lighter in colour, being a fairly light bluish brown. The third method consists of immersing the straw in running water. This is the form practised in Belgium, where the finest product of this kind in the world, the famous Courtrai flax, is retted in the murky waters of the sluggish river Lys. The flax straw, in bundles, is placed in crates, which are weighted with stones and submerged in the water of the streams for two periods, each of from four to 15 days, according to the temperature and other conditions. After the first immersion, the straw is taken out and carefully dried before the second retting. The Courtrai flax is of a light creamy colour, and of superior tensile strength. Its excellent qualities appear to be due not so much to the retting in sluggishly running water as to the actual qualities of that water and the peculiar ferment contained therein.

After the flax has been retted it undergoes a decorticating process, which removes the bark and the loosened, underlying, woody tissues and isolates the linen fibres in a purified condition. The first operation consists of passing the straw through a breaker, which loosens the woody portions of the stems and reduces them to fragments to facilitate the following operation, the scutching, which whips out the "chive" and all other waste matters, leaving the pure flax fibre. Within recent years machinery has been designed which successfully performs all the operations subsequent to retting, but in former times the work was done by hand or with very crude mechanical aids. One of the accompanying engravings shows an old-time scutching mill, consisting of a large wheel with flat radial wooden blades projecting from its periphery. These rapidly-revolving blades slashed the waste matter from the bundles of flax straw, which were held against a flat surface parallel to the plane of the wheel. The scutched flax is subsequently hackled or dressed by repeated combings, which remove the short and broken

or tangled fibres and thereby produce tow. Each hackling improves the quality of the fibre and, of course, adds to its cost.

Numerous chemical methods have been proposed for retting flax, to improve and shorten the natural processes, and numberless patents have been granted here and abroad, covering these artificial methods. Among them are processes consisting in heating with water under pressure, boiling with solutions of oxalic acid, soda ash caustic soda, or the addition of various chemicals to the retting water, such as hydrochloric and sulphuric acids. Numerous patents also exist on retting pools or tanks. Few of all these processes have proven of any industrial value. However, one of the exceptions to this appears to be a process covered by patents issued to two Belgians, Dr. Georges Loppens and Honoré Deswarte. Briefly, the process consists in covering a mass of vertically-arranged flax straw in special tanks with water, constantly delivering fresh water, preferably rain water, beneath the mass, and at the same time constantly withdrawing the same quantity of impure water from below the level of the fresh water. This method is now used at Northfield, Minn. During the first season it was not employed with entire success. but it appears that this deficiency may be ascribed to inexperience in the handling of the apparatus rather than to any fault of the process. There is little doubt that in the future the Loppens method, as it is called, will prove entirely successful, for it is extremely simple in operation and absolutely under the control of the operative.—*Scientific American.*

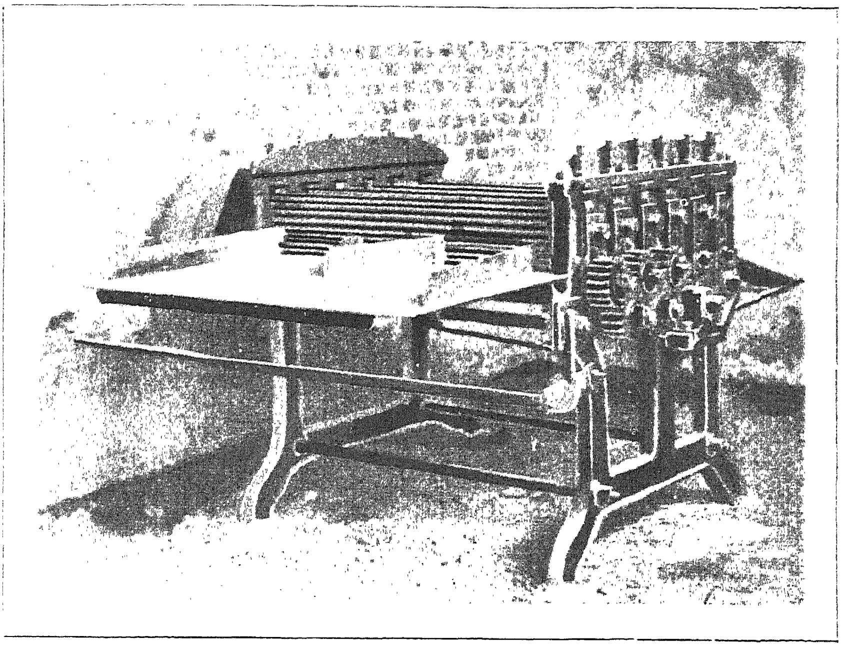
FODDER PLANTS.

CHAPTER II.

WESTERN AUSTRALIAN SALT-BUSHES.

(*Continued.*)

Atriplex semibaccata, R. Br. ("Salt-bush").—This is a procumbent or prostrate, many-branched, slender, perennial plant, with herbaceous stems spreading from one and a half to two or more feet. Under cultivation, however, its growth is simply marvellous, the stems lengthening out very much. The whole plant is pale green, though sometimes nearly white. Its leaves, arranged on short stalks, are somewhat variable in shape, but mostly oblong-lanceolate, or cuneate, sinuate-toothed, and rather thin, and from half to one inch long. This salt-bush will withstand a phenomenal amount of dry weather, and it has a high reputation as forage for stock. Sheep eat it with great avidity, and they thrive remarkably well on it. When left unmolested for a time it produces an abundance of seed, which germinates readily under ordinary circumstances. This *Atriplex* has proved a most valuable plant on some of the worst alkali lands of California; single



A Modern Rippling Machine.

The Flax Harvest. The Plants made into Bundles prior to Stacking.

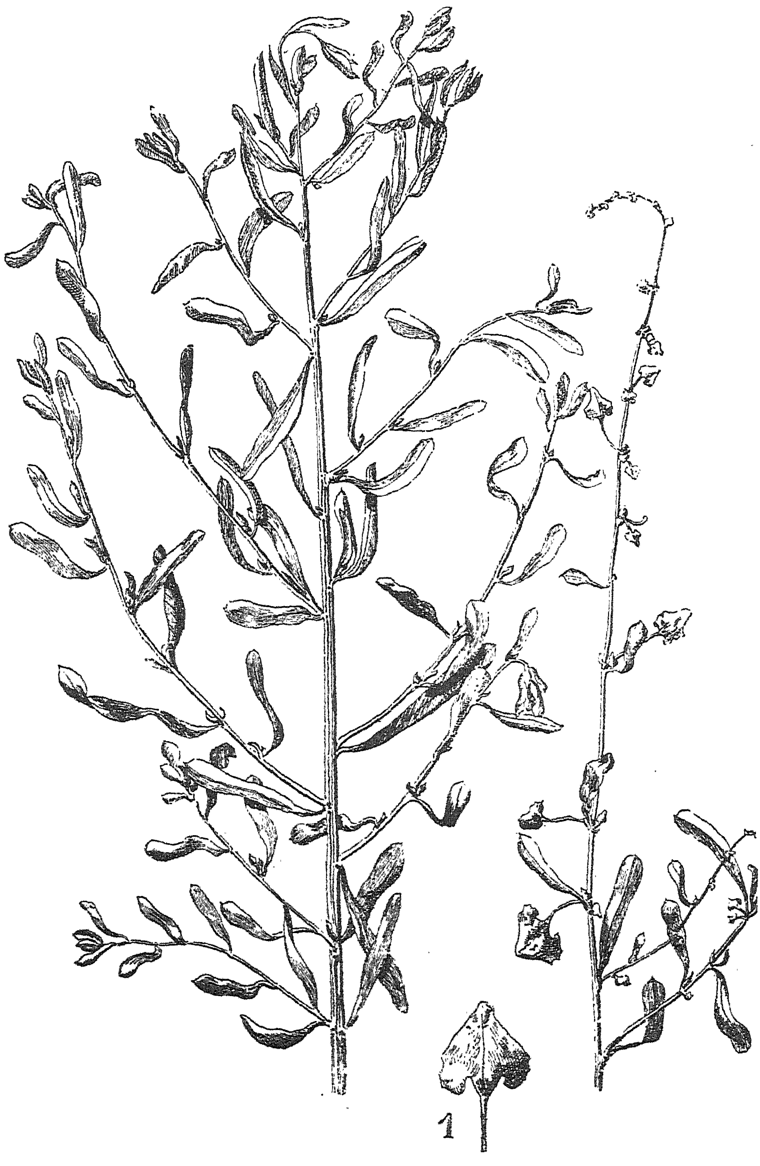
specimens are said to have covered a space with a diameter of sixteen feet in one season. "The yield of a full crop is about twenty tons of green material, or five tons of dry matter, per acre. Some seasons will permit of two such crops. It seems to be already demonstrated that this Australian species of *Atriplex* will constitute itself a most important industrial factor in this State, and will render productive vast tracts of land which are at present a blot on the landscape."—*Report Agricultural Expert Stations, California.*

Atriplex semibaccata, R. Br. ("Half-berried Salt-bush").

FIG. I.—Enlarged drawing of the fruit.

Atriplex stipitata, Benth. ("Salt-bush").—This species is an erect, bushy, rather slender shrub, covered all over with a white or somewhat brown scaly tomentum. The leaves are variable, but mostly narrow, oblong,

very obtuse, contracted into a short stalk, rather thick, and about three-quarters of an inch long. It is found on the arid plains of the interior, and is capable of withstanding a long period of dry weather without its growth being seriously checked. Sheep eat the plant with avidity, and



Antriplex stipitata (Benth. "Kidney-fruited Salt-bush.")

FIG. I.—Enlarged drawing of the fruit.

they seem to thrive on it. When left undisturbed for a time it produces a fair amount of seed which, when ripe, germinates readily under ordinary conditions.

Atriplex vesicaria, Hew. ("Salt-bush").—This is an erect, bushy shrub, attaining a height of about two feet, and covered with a scaly tomentum. The leaves are variable but generally oblong-lanceolate, contracted into a short stalk, and about three-quarters of an inch long. It is peculiar to the inland plains, and in some districts is fairly plentiful. This, however, may be attributed to the fact that the plant produces an abundance of seed when left unmolested for a time. This salt-bush is regarded as an excellent forage plant which sheep and cattle thrive on, but it is said that horses never do so, in fact they will seldom eat it unless other forage plants are scarce.

Atriplex vesicaria, Hew.—"Bladder salt-bush."
Fig. 1.—A fruiting branch. Fig. 2.—Section of a fruiting perianth.

Kochia planifolia (F.V.M. "Salt-bush.")—This is a divaricately-branched shrub, growing from two to three or more feet high. The branches and young foliage are covered with a soft and dense woolly tomentum which wears off the older leaves. The leaves are oblong, obtuse, arranged on short stalks, and rarely more than half-a-ninch long, rather thick, but flat. This shrub is found in the most arid parts of the continent, but it is not reported to be very plentiful anywhere. Stock are fond of it, and often eat it so close to the ground that it is generally found in a stunted condition. When left undisturbed for a time, however, it grows rapidly and produces an abundance of seed.

(To be continued.)

GARDEN NOTES FOR MARCH.

By Percy G. Wicken.

Most of the hot weather will now be over, and in the coastal districts rain may soon be expected. Advantage should be taken of the dry weather to get the garden cleaned up, and all diseased leaves or plants burnt. All rubbish and refuse of all sorts should be put in a heap and well damped, so as to cause it to rot, it will come invaluable as a fertiliser later on. Any ground not in use should be dug up roughly and exposed to the sun as much as possible; this will help to sweeten the soil, and also to destroy some of the insect pests which are in a dormant state in the crevices of the ground. The deeper the breaking up is done the better, although it is not always advisable to bring the subsoil to the surface, but it should be just broken up and left, and covered with the next lot of surface soil; this enables the moisture as well as the roots of plants to penetrate deeper into the soil, and thereby to stand the dry weather better, as they are able to obtain the moisture from a lower level. Cultivators should be kept incessantly going during the month, the more the surface soil is stirred up the moister will be the ground underneath, and the better the plants will grow. Only save such plants as are true to name for seed, and be sure the seed is thoroughly dry before putting it away.

Asparagus.—A bed of sufficient size should be prepared in good time for planting early in the season. It should be trenched 2ft. deep, keeping the surface soil on the top. Dig in while trenching a liberal supply of well-rotted farm-yard manure and mix well with the soil. The soil should be left in a rough condition as it will then have a good chance of mellowing by planting time.

Beans (French).—Except in a few of the warmer localities, this crop will be nearly over. In hot parts, where there is no danger of frost, a few rows may be sown.

Beans (Broad).—This vegetable likes a heavy clay or strong loam soil, although it will grow and bear in most soils. It should not be sown before the end of the month, and the ground requires to be well broken up, and if poor apply plenty of stable manure. Do not apply nitrogenous manures. Bone-dust, superphosphate, and potash are the manures which should be used. Sow in rows 3ft. apart and about five inches in the rows.

Beet (Red).—A few rows may be sown. Thin out the plants that are coming up from previous sowings.

Borecole or Kale.—This is a plant which some like as a vegetable. and others do not think it worth growing. Seeds may be sown the same as cabbage, and plants put out. It yields a large amount of green stuff, which can be used for the table or for stock.

Cabbage, Cauliflower, and Brussels-sprouts.—Plenty of plants should be available from the seed beds, and they should be planted out as soon as the ground is moist enough. Plant in rows 3ft. apart and 2ft. in the rows.

Carrots.—Sow for the winter. The drills should be 18in. apart. The seed takes some time to come up, and the weeds want looking after.

Lettuce.—Sow a little seed to have a few plants handy for planting out when required; for garden use it is better to plant out only a few plants at a time and have them fresh than to plant a number at one time and perhaps have them wasted.

Melons and Pumpkins.—Store away for future use all those that are sound, they will be useful later on; any dry shed will do to store them in.

Sweet Potatoes should now be ready to dig. They can be stored, and if kept in dry sand will keep good throughout the winter.

Tomatoes are getting scarce; destroy by burning or boiling all diseased fruits, to prevent the spread of disease.

Peas.—In cooler districts a few rows of peas may be sown. Work the ground well, and apply plenty of potash and manures.

Turnips.—Prepare as much land as you require for this crop, and as soon as the rain comes sow full crops. There are a great number of varieties to choose from in both white, yellow, and Swede varieties.

Farm.—Harvesting and carting, the results of the harvest, being now over, all the machinery used for the purpose should be overhauled and well oiled before being put away. All machinery when the season is finished should be put away in such a condition that it is ready for use at a minute's notice. Rust and exposure to the weather do more harm than actual use. Seed drills should be looked to so that they are ready for use at any time in case an opportunity occurs to sow some barley, etc., for early green feed. In sowing wheat early in the season, the later or slow-growing varieties should be sown first, as they then have a better chance of maturing early. If a very early variety is sown very early in the season, it often happens that it comes to maturity so early that the weather is very much against the harvesting operations, or, as happens in the Southern districts, the ground is so soft that it is impossible to take a binder on the ground, or if cut for hay the crop is deteriorated by getting wet after cutting. If sowing has to to be done very late in the season, then sow the earliest variety of wheat you can obtain. If weeds have started to come up on land that has been laying fallow, it will require to have the scarifier over it to kill the weeds before sowing the wheat. All grain should be pickled in a solution of blue stone before sowing.

LOCAL MARKETS' REPORTS.

W.A. GENERAL PRODUCE COMPANY'S REPORT.

Market report of the W.A. General Produce Company, 245 Murray Street, Perth, for the month ending 7th February, 1906 :—

Business during the past week very good; supplies more or less fluctuating; likewise values. Detail particulars as follows:—Bacon not over plentiful, values firm. Hams, Hutton's, very scarce; others fairly plentiful. Butter: Stocks on spot still short; values, f.o.b., although easier, believed to be of temporary measure. Cheese, mild lots, selling well; values shade higher. Eggs, suburban lots, in great request; country lots, very many arriving not being fresh, hence at a great disadvantage to secure good price for them. Potatoes, suburban garden lots, very scarce; country lots more or less wormy. Onions, fair supplies; values weak. Chaff supplies barely enough; values steadily rising. Millers' lines continue unsettled; values considered very low all round. Fruit—Large supplies daily; values greatly fluctuating. Vegetables continue scarce, and values rising gradually. Poultry market over supplied with hens and ducks, whereas full-grown chickens are scarce. Good demand for fat large turkeys. Game—Many inquiries for fresh-killed black duck, teal, and mountain duck; also wild turkeys.

Farm and Dairy Produce.—Bacon: Hutton's, 9½d.; Newnham's and Barnes', 8½d. Ham: Hutton's, 1s. 1½d.: others, 6d. to 9d. Butter: Euroa, 1s. 1½d.; Millewa, 1s. 1¼d.; Benalla, 1s. 1¼d. Lard, in bladders, 7½d. Cheese: Loaf, 8¼d. to 9d.; medium, 8½d. Eggs: Suburban lots, 1s. 6d. to 2s.; country lots, 1s. 3d. to 1s. 9d. Potatoes: Local, new, good quality, £8 11s. to £11; inferior, £3 10s. to £6; suburban garden lots, 11s. to 13s. 6d. per cwt. Onions, 5s. 6d. per cwt. Chaff: Prime lots, £4 15s. to £5; good, £3 15s. to £4 5s. Bran, £6 to £6 10s. Pollard, £6 to £6 10s. Flour: Peerless, Premier, Thomas', Gilliespie's, and Eureka, sacks £9, quarters £9 5s. Oats: New Zealand, 3s. 8d. to 3s. 10d. bushel; Algerian, from 2s. 10d. to 3s. bushel. Wheat, truck lots, 3s. 7d. to 3s. 9d. per bushel. Oil cake, worth £9 per ton.

Fruit.—Oranges, Italian, from 18s. to 21s. per case. Lemons, Italian, from 18s. to 21s. per case. Bananas, worth 15s. to 22s. 6d. Passion fruit, from 4s. 6d. to 10s. per case. Grapes: Muscatels, 4s. 6d., 5s. 6d., 6s. 6d. a case; others, from 2s. 6d. to 5s. Figs, from 3s. 6d. to 4s. 6d. Peaches, from 2s. 6d., 3s. 6d., 4s., 5s. 6d., 7s., 12s. a case. Nectarines, from 3s., 4s., 5s. 6d., 10s. a case. Plums: Japanese, 5s. to 12s. 6d. a cass; other sorts, from 2s., 2s. 6d. to 4s. a case. Apples: Eating, from 6s. 6d. to 12s. a case; cooking, from 4s. 6d. to 6s. a case. Melons: Rock, from 1s. to 9s. 6d. a dozen; water, from 1s. 6d. to 8s. 6d. a dozen.

Vegetables.—Cabbage, from 2s. 6d. to 13s. per cwt. Carrots, from 9d., 1s. 3d., 1s. 9d. per dozen bunches. Parsnips, from 9d. to 1s. 6d. per dozen bunches. Turnips, white, from 6d. to 1s. 6d. per dozen bunches. Beans, French, from 3d. to 4½d. per lb. Peas, green, from 4d. to 5d. Marrows, 1s., 1s. 6d. to 3s. per dozen. Pumpkins, 4s. 6d. to 6s. 6d. per cwt. Rhubarb, from 1d. to 3d. per bundle. Salads and Herbs—Lettuce, worth from 1s. to 2s. per quarter bag. Spring onions, 3d. to 6d. per dozen bunches. Beetroot, 6d., 9d., 1s. per dozen bunches. Cucumbers, 6d., 9d., 2s. per dozen. Tomatoes: Half green, 3s. 6d. to 5s. per case; ripe, 1s. to 4s. 6d. Celery, 6d., 9d., 1s. 3d., 2s. 6d. per dozen heads. Radishes, 3d. to 5d. per dozen bunches. Thyme, marjorum, sage, 1s. 6d. dozen bunches. Mint, from 4d. per bundle. Parsley, 2d. to 4d. per bundle.

Poultry (for killing).—Fowls, hens, 3s. 6d. to 4s. 6d. Chickens: Full grown, 4s. 6d. to 6s. 6d.; smaller, from 3s. to 4s. Ducks, from 3s. 6d. to 5s. Duck'ings, from 2s. to 3s. Geese, from 8s. to 10s. Turkeys: Gobblers, good, 20s. to 25s.; medium, 15s. to 18s. 6d.; hens, 9s. to 12s. 6d. Game—Black duck, worth 3s. Teale, worth 2s. Mountain duck, worth 2s. 6d. Wild turkey, 6s. per pair.

Carcase Meat.—Pork, medium weights, 5d. to 6d. per lb.

Sundries—Corn sacks, secondhand, 4s. 6d. per dozen. Bran bags, secondhand, 3s. 3d. per dozen. Bonedust, £7 10s. per ton. Bonemeal, £8 per ton. Phosphate. £4 5s. per ton. Superphosphate, £5 10s. per ton. Guano, amonical, £4 10s. per ton, Kainit, £4 15s. per ton. Nitrate of superphosphate, £6 10. per ton. Special vegetable manure, £7 per ton. Potatoes, onions, and other root crop manures, £7 10s. per ton. Thomas' phosphates (English grade), £4 5s. per ton. Nitro superphosphate, £6 10s. per ton.

MESSRS. H. J. WIGMORE & CO.'S REPORT.

Messrs. H. J. Wigmore & Co., of Fremantle, Perth, Kalgoorlie, and Northam, report as follows in connection with their daily auction sales of chaff and grain at Perth and Fremantle railway yards during month ended Friday, 9th inst:—

Chaff.—Since we last reported to this *Journal* developments have taken place in the chaff market which, to say the least of it, are extraordinary for this period of the year. For instance, considerable importations of South Australian chaff have been made by merchants in the West, and these can now be landed at a cost of under £4 10s. on rails for prime quality. These importations can easily be accounted for when the tenacity of holders in the country in hanging on to their chaff in anticipation of higher prices during the winter months is taken into consideration. Whether they are wise or not of course remains to be seen. As far as we are concerned, our own opinion is that unless something unforeseen occurs, such for instance as a rise in South Australia, or an advance in freights, neither of which contingencies appear probable, no material rise in the market can be looked for. The general intention on the part of farmers seems to be to hold on to their supplies until about June. If this is so, and consignments still continue to arrive from South Australia (and there appears to be no likelihood of these discontinuing), heavy yardings will occur from June on, and of course this would not allow of any material advance in prices. The chaff market is in an excellent condition at the present moment, and £4 17s. 6d. has been realised in several instances during this week, which shows an advance of 5s. to 7s. 6d. per ton on prices ruling last week; and this is solely owing to the extraordinarily light arrivals (for this time of the year at any rate). We certainly cannot conscientiously advise farmers to pass present rates. Storing operations in Perth are not now being indulged in to any great extent, and we cannot advise farmers to store at the moment, although we are always prepared to do so when definitely instructed, as we have commodious premises in Perth, conveniently situated, and admirably adapted for the purpose. We quote closing values as follow:—F.a.q. to prime wheaten, £4 15s. to £4 17s. 6d. per ton; good medium wheaten, £4 10s. to £4 12s. 6d.; medium and inferior wheaten, from £3 17s. 6d. upwards. Fremantle market is in practically the same condition. Supplies during next week promise to be more plentiful, but if the yardings are not too large on several consecutive days we doubt very much if the market will ease to any serious extent.

Wheat.—This commodity has slumped during the month, owing to heavy arrivals. Perth and Fremantle markets are both overstocked at the moment, prices now being realised at both centres not being equal to country equivalent. Best price obtainable for prime milling is 3s. 7d., and even this price is difficult to obtain. We do not advise consignments at the present moment.

Flour.—We have sold very heavily of Thomas & Co.'s Port Adelaide and Northam "Standard" during the month, last week alone total quantity approximating 600 tons. We invite inquiries from bakers, and quote prices £7 12s. 6d. f.o.b. Port Adelaide, £8 5s. rails Northam, for sacks (½s) 5s. extra.

Oats are very firm in the East, and quotations on spot also show an upward tendency. Melbourne quotes 1s. 11½d. f.o.b. for good feed prompt shipment, and same money is also asked for shipment during March. For forward contracts, spread throughout the year, 2s. 1½d. is quoted aboard. We sold many thousands of tons about the middle of the month at 1s. 10½d. f.o.b. Melbourne for forward shipment.

Bran and Pollard are in short supply on spot, and this state of affairs also prevails in the Eastern States. On spot bran is worth £5 10s., pollard £5 15s. to £5 17s. 6d. on rails Fremantle. Sydney quotes 10½d., Melbourne 11d., and Adelaide 10¾d.

Potatoes.—Stocks are exceedingly light. Best locals are quoted up to £14, and owing to a big rise in Melbourne and Adelaide the position is likely to be most acute for some weeks. Melbourne quotes limited parcels at £7 aboard, and Mount Gambier potatoes have been withdrawn owing to the intense heat prevailing in South Australia, which naturally has the effect of making growers afraid to dig their crops.

Kalgoorlie Chaff Market.

Consignments to Kalgoorlie have not been large during the week, and we have to report a good demand existing for prime qualities. We quote closing values as follow:—Prime green wheaten £5 7s. 6d., with probably an extra 2s. 6d. for a choice sample; F.A.Q. wheaten, £5 5s.; medium qualities up to £4 17s. 6d. A truck or two of prime oaten chaff would realise at the present moment £5 7s. 6d. to £5 10s.

PRODUCE MARKET PRICES.

Wheat.—Country, 3s. 1d. to 3s. 4d.; Perth and Fremantle, 3s. 6d. to 3s. 7d.

Flour.—On spot (Fremantle): South Australian lines are quoted at £9 17s. 6d. for sacks, and 5s. more for 50's. Local brands at mills from £8 7s. 6d. (Northam and Beverley) to £8 17s. 6d. at Fremantle. Manitoba Glenora, £15.

Bran.—Up to £6 5s. Perth.

Pollard.—Up to £6 10s. Perth.

Chaff.—Wheaten: Prime, £4 15s. to £4 17s. 6d. f.a.q.; medium, £4 7s. 6d. to £4 10s. Oaten, to £4 12s. 6d. All at auction.

Oats.—Algerian, 2s. 5d. to 2s. 6d. Fremantle; New Zealand, 3s. 5d. to 3s. 6d.

Butter.—In Melbourne: Best Western District, 11d. to 10½d. f.o.b.; other lines, 10½d. to 10¾d. On spot: Best Victorian, 1s. 1½d.

Cheese.—Victorian loaf, 6d.; medium, 5¾d.; Imp. Gruyere, 1s. 3d.; Edams, 11½d. Stilton, 2s.; Gorgonzola, 2s.; McLarn's Imperial, 14s. 6d. per doz.; Midget cream Goudas, 30s. doz.; Osborne's Federal, 13s.

Bacon.—On spot: Farmer's, 9¾d.; Castle, 9d.

Hams.—English, Hunter's, 1s. 2d.; Farmer's, 1s. 1d.; Swift's American, 1s. 1d.

Lard.—Imported, in bladders or 1lb. pats, 7¾d.; Swift's American Silver Leaf, 7d.

Eggs.—The Adelaide quotation f.o.b. to-day is 8¼d., and on spot values of South Australian, 1s. At auction fresh local eggs are selling from 2s. to 2s. 2d. for highest grades.

Potatoes.—Local, £8 5s. to £12; imported, £12.

Onions.—Up to £5.

STOCK MARKET.

Elder, Shenton and Co., Limited, report:—Not very much business is passing at present, and the market for store stock is inclined to weaken. Fat stock are firming, and good lines of breeding ewes are in request. Quotations:—Fat sheep: The market is firm at 5d. to 5½d., Fremantle. Beef: Prices remain unchanged, 4d. to 4½d. being the current quotations. Store sheep: Good lines of ewes in lamb not over six-tooth are worth 20s. to 23s. Good sound-mouthed lines, 16s. to 18s. Aged ewes, 8s. to 12s. Store wethers are weak, and sales have been made as low as 13s. Weaners are worth 10s. to 12s. Store cattle: Milch cows make from £10 to £15. Store cows and steers, £4 to £6. Young cattle, from £2 upwards. Pigs: Porkers are worth 5½d. Fremantle. Good stores, 16s. to 19s. Young pigs not in demand. Horses: Stout draughts and heavy sorts sell at from £45 to £60; medium draughts, £30 to £45; active farm horses, £25 to £30.

York Combined Sale, February 6:—A good yarding of stock was submitted by agents, but the attendance of buyers was small and business limited. Fat sheep sold to 18s., pigs at from 10s. to 17s. for stores up to 35s. for porkers.

Messrs. John M. Hopkins and Co. report:—We sold a line of local springers at £10 per head. Heifers: Only a small lot offering; these were placed easily at £4 per head. Horses: We sold delivery sorts at £25 per head. Draughts were harder to place. Good farm mares we sold to £35; inferior, from £15 to £20. Sales at our W.A. Stock Bazaar were well attended. The demand continues firm for all lines of fresh country horses. A consignment of light horses from Busselton averaged £9 per head.

SHEEPSKINS.

Messrs. Dalgety and Co., Limited, report having received the following cable from their London office:—"Sheepskins: Since our last telegram prices for merinos are higher by par to ¼d.; fine crossbred skins are higher by ¼d.; coarse crossbred are higher by ½d."

EXPORTS.

THE JANUARY RETURNS.

The value of the goods exported from Western Australia during the past month (January) was £1,083,144, made up as follows:—Goods of Australian origin £1,081,110, and oversea origin £2,034. The principal items included: Bark (tanning), 3,533cwt., £1,480; copper contained in matte, 1,872cwt., £7,500; gold (uncoined), £249,482; lead, pig, 2,403, £1,535; machinery, excepting agricultural, £2,735; ores, exclusive of gold, £2,085; pearlshell, 228cwt., £898; sandalwood, 21,547cwt., £6,520; silver, 45,142ozs., £5,939; skins, sheep, 53,356, £7,117; skins, other, £998; gold (coined), £729,000; timber, £36,830; wool, greasy, 734,971lb., £24,499; scoured and washed, 73,675lb., £4,912.

THE STATE'S RAINFALL FOR 1905.

The accompanying table shows the rainfall for last year at all stations from which complete returns have been received, together with the means for previous years where the records extend over at least six (6) years.

It will be seen that in the principal agricultural districts (South-West division) the rainfall was heavier than usual. This was particularly noticeable South and South-East of Beverley for about 100 miles, where the fall was, on an average, about 10 inches in excess. The greatest quantity recorded at any single station was 57·15 inches at Jarrahdale, an amount nearly 15 inches in excess of the average for the previous 22 years.

On the Coolgardie fields the rainfall was slightly below normal. On the South coast it varied from a slight excess at Cape Leeuwin to a considerable deficiency at the Eastern boundary.

Throughout the remainder of the State it was less than usual, and in the Kimberley district it was generally only about half the average of previous years. The monthly distribution may be summarised as follows:—

January.—Light throughout.

February.—Light throughout, except between Geraldton and the North-West Cape.

March.—Still very light.

April.—Normal in the South-West districts. Light on the goldfields and in the tropics.

May.—Below the average throughout, but moderately heavy in the extreme South-West.

June.—Below the average throughout, but moderately heavy in the extreme South-West.

July.—Rather above normal in West and South-West coastal districts; elsewhere light.

August.—Below normal throughout, except on a portion of the North-West district between Cossack, Condon, and Nullagine.

September.—Very heavy in the South-West districts; elsewhere light.

October.—Slightly below normal throughout, except in a portion of the South-West districts adjoining the Great Southern Railway, where a very heavy storm on the 7th and 8th raised the totals considerably.

November.—About normal.

December.—Irregular. On the whole, lighter than usual in the Northern half of the State, and heavier in the Southern half, especially on the Coolgardie goldfields.

The Observatory, Perth,
18th January, 1906.

W. E. COOKE,
Per E.A.W.

RAINFALL for Year, 1905 (completed as far as possible), and Averages for Previous Years.

Stations.	Year, 1905.		Previous Years.	
	No. of points. 100 = 1in.	No. of wet days.	No. of points. 100 = 1in.	No. of Years.
East Kimberley:				
Wyndham ...	1440	46	2897	18
6-Mile	1507	26	...	...
The Stud Station	...	...	...	...
Carlton	...	...	2372	6
Denham	...	...	...	...
Rosewood Downs	...	...	2698	10
Argyle Downs ...	...	..	2625	13
Lisadell	...	...	2346	9
Turkey Creek ...	2096	50	2920	7
Ord River ...	...	...	2011	9
Alice Downs ...	...	...	...	...
Hall's Creek ...	824	35	2271	14
Nicholson Plains	...	...	...	...
Flora Valley A ...	755	29	2069	6
Ruby Plains ...	...	...	...	...
Denison Downs...	...	...	2061	5
West Kimberley:				
Obagama A ...	1764	32	3472	2
Beagle Bay B ...	1655	33	...	...
Pt. Torment A ...	1863	32	...	...
Derby	1610	42	2756	19
Yeeda B... ...	1272	31	2334	14
Liveringa ...	1149	22	2331	5
Mt. Anderson ...	...	...	...	...
Leopold Downs...	1341	38	2362	5
Fitzroy Crossing	1167	39	2424	11
Fitzroy (C. Blythe) A ...	903	21	...	...
Quanbun A ...	993	20	2246	6
Nookanbah ...	...	...	2010	6
Broome	1012	28	2434	15
Roebuck Downs	1180	31	...	...
Thangoo ...	...	...	2300	11
La Grange Bay...	949	29	1999	14
North-West:				
Wallal	854	25	1672	8
Condon	878	18	1572	15
Pardoo A ...	668	14	...	...

Stations.	Year, 1905.		Previous Years.	
	No. of points. 100 = 1in.	No. of wet days.	No. of points. 100 = 1in.	No. of Years.
North-West—*contd.*				
DeGrey River A	916	14	1183	16
Port Hedland ...	848	25	1659	7
Boodarie ...	780	14	1356	17
Warralong ...	994	23	1590	6
Muccan	...	...	1460	7
Ettrick A ...	683	15	...	...
Mulgie A ...	645	19	1338	16
Eel Creek B ...	642	17	1592	7
Station Peak ...	833	24	...	...
Coongon ...	888	26	1265	10
Warrawagine ...	...	...	1653	7
Bamboo Creek ...	797	32	1942	7
Marble Bar ...	1038	39	1489	10
Warrawoona ...	953	—	1651	5
Corunna Downs	830	24	1415	7
Nullagine ...	705	19	1561	7
Mt. Edgar ...	...	...	...	...
Kerdiadary A ...	470	10	...	...
Roy Hill B ...	259	7	...	...
Middle Creek A	503	13	...	...
Mosquito Creek	956	—	...	...
Mulga Downs A	505	15	1288	7
Woodstock A ...	704	11	...	...
Mt. Florence ...	736	18	1553	18
Tambrey ...	529	20	1833	8
Millstream ...	673	11	1584	8
Yandyarra ...	...	...	...	...
Mallina A ...	938	17	...	...
Whim Creek ...	803	15	2732	7
Cooyapooya A ...	1031	15	1530	5
Woodbrooke ...	634	13	1677	7
Croydon ...	713	13	...	...
Balla Balla ...	...	...	1798	6
Roebourne ...	635	16	1328	18
Cossack	971	12	1181	23
Sherlock A ...	737	8	...	...
Fortescue ...	668	13	1043	17
Mardie	404	9	716	17
Mt. Stewart ...	331	12	1709	5
Yarraloola ...	528	8	1060	6
Chinginarra ...	640	7	840	15
Onslow	517	17	834	19
Peedamullah ...	844	19	1140	10
Red Hill B ...	457	10	1590	6
Mt. Mortimer B...	475	11	907	8
Peake Station B	649	11	...	...
Wogoola A ...	560	10	1159	6

RAINFALL FOR THE YEAR 1905—*continued.*

Stations.	Year, 1905. No. of Points. 100 = 1in.	Year, 1905. No. of wet days.	Previous Years. No. of Points. 100 = 1in.	Previous Years. No. of years.
North-West—*cont.*				
Nanutarra A ...	535	—	1181	6
Yanrey A ...	492	12	1115	8
Point Cloates ...	...	...	1214	6
Edmunds A ...	461	20	...	...
Gascoyne:				
Winning Pool ...	859	22	...	...
Coordalia ...	...	...	...	...
Towara A ...	400	19	1052	12
Ullawarra A ...	185	4	895	8
Maroonah ...	...	...	856	9
Gifford Creek A ...	416	14	...	...
Bangemall A ...	356	11	967	5
Mt. Augustus ...	...	...	...	...
Minnie Creek A ...	621	25	...	...
Yanyeareddy A ...	671	15	1317	6
Williambury A ...	868	18	834	16
Booloogooroo ...	...	...	...	...
Wandagee A ...	878	—	...	..
Bernier Island ...	...	...	...	...
Boolathana ...	977	27	997	8
Carnarvon ...	1032	38	880	22
Brick House ...	1159	31	...	...
Doorawarrah B ...	562	22	801	7
Bintholya B ...	475	8	...	...
Mungarra ...	558	14	...	...
Dairy Creek A ...	549	25	...	...
Clifton Downs ...	...	...	877	6
Upper Clifton Downs	...	...	...	...
Dirk Hartog Is.	...	...	1179	11
Sharks Bay ...	914	32	739	11
Kararang A ...	965	44	967	11
Meedo	967	32	897	5
Tamala A ...	1469	52	...	...
Wooramel ...	833	30	946	6
Hamelin Pool ...	887	41	758	19
Byro A	746	24	848	6
Yarra Yarra ...	798	28	731	6
Berrringarra ...	793	27	802	17
Mt. Gould ...	651	22	736	11
Moorarie ...	545	24	645	12
Wandary ...	...	...	...	...
Peak Hill ...	617	28	1163	7
Mt. Frrser ...	...	...	...	...
Abbotts	484	15	1035	6
Belele	...	...	841	5
Gascoyne—*contd.*				
Mileura	818	31	914	6
Milly Milly ...	694	27	712	6
Manfred	912	42	742	6
New Forest ...	1558	34	...	...
Woogorong A ...	662	30	750	5
Boolardy ...	507	14	704	14
Twin Peaks ...	...	...	...	...
Billabalong ..	887	17	...	...
Wooleane ...	675	32	757	10
Woolgorong B ...	1063	44	...	...
Murgoo	581	33	721	16
Yallalonga ...	...	...	...	...
Meka	668	22	...	...
Mt. Wittenoom ...	613	33	...	...
Nannine	649	27	784	10
Star of the East	712	—	989	5
Annean	784	—	773	13
Tuckanarra ...	...	...	...	...
Coodardy ...	625	21	...	...
Cue	1814	44	785	10
Day Dawn ...	755	31	718	9
Lake Austin ...	824	26	767	7
Lennonville ...	804	43	...	...
Mt. Magnet ...	682	44	714	10
Challa	608	32	690	9
Youeragabbie ...	699	24	687	6
198-Mile	...	...	...	...
Nungarra ...	812	33	...	...
Murrum	...	...	...	...
Burnerbinmah ...	878	50	...	...
Barnong A ...	1091	46	...	...
Mellenbye A ...	1079	62	...	...
Yalgoo	1002	46	814	8
Wagga Wagga ...	...	...	...	...
Gabyon	1060	43	931	14
Tallyrang A ...	1111	33	...	...
Gullewa A ...	1015	39	...	...
Muralgarra ...	928	36	...	...
Wydgee	946	39	...	...
Wearagaminda ...	...	...	...	...
Gullewa House A	1105	55	...	...
South-West Division (Northern Part):				
Murchison House	1608	61	1496	5
Mt. View ...	932	40	1268	5
Mumby A ...	1936	73	...	...

RAINFALL FOR THE YEAR 1905—*continued.*

Stations.	Year, 1905.		Previous Years.	
	No. of Points. 100 = 1in.	No. of wet days.	No. of Points. 100 = 1in.	No. of years.
South-West (Northern)—*contd.*				
Yuin	940	30	...	...
Northampton ..	2646	72	2051	23
Oakabella ...	...	...	1758	9
Narra Tarra ...	...	...	1805	5
Tibradden ...	2171	85	...	...
Myaree	2245	77	...	...
Sand Springs ...	1871	51	...	...
Mullewa... ...	1323	69	1102	9
Chapman Exp. Farm	...	...	...	...
Kockatea ...	1479	52	...	...
Bootenal ...	2030	—	...	...
Geraldton ...	2085	94	1724	28
White Peak A ...	2069	—	...	...
Greenough ...	1922	68	1951	23
Bokara	2170	92	...	...
Dongara ...	2160	69	1917	22
Brookman's Hills	...	...	...	...
Strawberry ...	...	...	...	...
Nangetty ...	...	...	...	...
Mingenew ...	1898	89	1567	9
Urella	1670	57	...	...
Yandenooka ...	2067	—	...	...
Rothesay ...	...	...	1099	6
Ninghan ...	...	...	...	...
Field's Find ...	972	43	900	6
Condingnow ...	995	41	...	...
Carnamah ...	1618	73	1443	17
Watheroo ...	1700	79	1567	5
Nergaminon ...	...	...	...	...
Dandaragan ...	2794	92	2242	7
Moora	1908	77	1644	7
Yatheroo A ...	2599	71	2430	20
Walebing ...	2253	102	1804	21
Round Hill ...	2000	85	...	...
New Norcia ...	2227	85	2003	22
Wannamel ...	2915	88	...	...
South-Western Division, Central (Coastal):				
Gingin	3730	84	2973	16
Belvoir	3806	91	2916	16
Mundaring ...	4658	84	1404	11
Wandu	3721	135	..	...
Guildford ...	3533	105	3331	25
Kalbyamba ...	3456	96	...	...
Canning Waterworks	3882	—	3917	15
Perth Gardens ...	3400	102	3305	29

Stations.	Year, 1905.		Previous Years.	
	No. of Points. 100 = 1in.	No. of wet days.	No. of Points. 100 = 1in.	No. of years.
South-Western (Coastal)—*contd.*				
Perth Observatory	3462	106	3272	8
Highgate Hill ...	...	...	...	...
Subiaco	3257	99	3180	7
Claremont ...	...	...	...	...
Wanneroo ...	...	...	...	...
Jandakot ...	4102	—	...	...
Fremantle ...	2637	101	2905	27
Rottnest... ...	2529	103	2865	23
Armadale ...	3795	—	...	...
Rockingham ...	2609	—	3277	7
Mundijong ...	...	...	...	...
Jarrahdale (Norrie)	4671	—	...	...
Jarrahdale ...	5715	112	4241	22
Serpentine ...	3981	115	...	...
Mandurah ...	4247	95	3468	15
Pinjarra (Blythewood)	3798	—	...	...
Pinjarra... ...	3995	98	3788	26
Yarloop	3978	117	...	...
Harvey	3935	105	3820	8
Upper Murray ...	4829	122	...	...
South-West, Central Part (Inland):				
Hatherley ...	1800	64	1440	7
Dowerin... ...	1586	64	...	...
Momberkine A ...	1743	62	...	...
Monglin... ...	...	...	...	...
Warramuggin ...	...	...	...	...
Newcastle ...	2664	79	2053	25
Emungin ...	...	...	...	...
Craiglands ...	4120	—	..	...
Eumalga ...	2848	85	2187	6
Eadine	...	...	...	...
Northam ...	2258	94	1586	24
Grass Valley ...	1913	—	1556	15
Meckering ...	1620	71	1474	5
Cunderdin A ...	1504	66	...	...
Codg-Codgen A...	1204	58	...	...
Yarragin ...	1270	60	...	...
Doongin ...	1169	57	1233	10
Cuttening ...	1257	72	1281	9
Whitehaven ...	1970	54	1616	5
Cardonia ...	1245	—	...	...
Sunset Hills ...	2078	81	1608	5
Jelcobine ...	...	...	...	...
Cobham	2436	98	1761	12
Yenelin B ...	1669	60	...	...
Mt. Caroline ...	1346	54	...	...

RAINFALL FOR THE YEAR 1905—*continued.*

Stations.	Year, 1905. No. of points. 100 = 1in.	Year, 1905. No. of wet days.	Previous Years. No. of points. 100 = 1in.	Previous Years. No. of Years.
South-West (Inland)—*contd.*:				
York ...	2369	99	1714	28
Dalebridge ..	2237	79	...	...
Beverley ...	2737	70	1442	22
Bally Bally ...	2286	92	...	...
Oakdale	...	...	...	...
Barrington ...	2034	74	1610	8
Qualin	1934	58	...	...
Stock Hill ...	2145	60	...	...
Sunning Hill ...	2563	96	1762	16
Brookton ...	2245	73	...	...
Wandering ...	3849	—	2283	16
Glen Ern ...	2761	—	...	...
Pingelly ...	2547	74	1609	14
Yornaning ...	2307	96	...	...
Marradong ...	3586	88	2774	7
Crooked Pool ...	...	...	...	...
Bannister ...	3460	86	2611	20
Wonnaminta ...	2342	92	...	...
Narrogin ...	2357	97	1825	13
Narrogin State Farm	2656	95	...	...
Wickepin B ...	2155	77	1763	7
Gillimaning ...	2171	83	...	...
Bunking ...	1957	49	...	...
Bullock Hills ...	1925	63	...	...
Bullingarra ...	...	...	...	...
South-West Division (Southern Part):				
Bunbury ...	3713	123	3674	28
Brunswick ...	3913	86	...	...
Collie	4109	122	...	...
Glen Mervyn ...	4158	100	...	...
Donnybrook ...	4171	110	...	...
Boyanup ...	3779	100	3653	7
Ferndale A ...	3866	91	...	...
Busselton ...	2966	131	2932	24
Quindalup ...	3243	120	3828	9
Cape Naturaliste	2917	121	...	...
Glen Lossie ...	3376	—	...	...
Lower Blackwood	3626	103	4326	5
Karridale ...	4578	180	4368	11
Cape Leeuwin ...	3831	183	3494	8
Bidellia	4366	115	...	...
The Warren B ...	3538	127	5329	6
Lake Muir ...	3270	116	3055	6
The Peninsula ...	...	...	...	...

Stations.	Year, 1905. No. of points. 100 = 1in.	Year, 1905. No. of wet days.	Previous Years. No. of points. 100 = 1in.	Previous Years. No. of Years.
South-West (Southern)—*contd.*				
Mordalup ...	2796	108	...	...
Deeside	3279	134	...	...
Riverside ...	3258	118	3145	5
Balbarup ...	3251	95	3497	7
Wilgarup ...	3819	137	...	...
Cundinup ...	2473	83	...	...
Bridgetown ...	3465	128	3269	17
Westbourne ...	3069	123	...	...
Hilton A ...	2737	—	...	...
Greenbushes ...	4361	89	3627	12
Greenfields ...	3490	103	...	...
Glenorchy ...	2748	76	...	...
Williams ...	2526	83	2142	20
Arthur	2325	77	1819	14
Rifle Downs ...	2740	—	...	...
Darkan A ...	2493	57	2095	6
Wagin	2295	87	1668	14
Glencove ...	2194	98	1858	6
Dyliabing ...	1990	101	1612	7
Katanning ...	2453	101	...	...
Kojonup ...	3406	108	2114	20
Broomehill ...	2180	96	1808	14
Woolagarup ...	...	...	...	...
Sunnyside ...	2443	112	1813	7
Talbot House ...	2389	79	...	...
Woodyarrup ...	2050	99	1873	5
Mianelup ...	1732	107	...	...
Cranbrook ...	2194	95	1771	14
Toolbrunup ...	1977	87	...	...
Tambellup ...	2615	108	...	...
Blackwattle ...	...	...	...	...
Woogenellup ...	2237	117	...	...
Mt. Barker ...	3027	155	2653	18
Kendenup ...	2834	116	...	...
St. Werburgh's...	2893	130	2558	12
Forest Hill ...	3702	166	3319	5
Wilson's Inlet ...	3937	151	4742	7
Grassmere ...	3833	165	...	...
Albany	4012	181	3474	28
King River ...	3480	104	...	...
Point King ...	3619	141	3539	9
Breaksea ...	3731	205	2679	15
Wattle Hill ...	...	...	3356	7
Cape Riche ...	2421	86	2238	8
Cherilallup A ...	1978	73	...	...
Pallinup B ...	1859	73	1512	14
Bremer Bay ...	2483	114	2276	20
Peppermint Grove	2893	116	...	...
Jarramongup A ...	1447	91	1565	10
Chillinup ...	...	...	...	...

RAINFALL FOR THE YEAR 1905—*continued.*

Stations.	Year, 1905.		Previous Years.	
	No. of points. 100 = 1in.	No. of wet days.	No. of points. 100 = 1in.	No. of Years.
Eastern Division:				
Dural A	702	23	...	...
Wiluna	615	32	1267	6
Gum Creek ...	512	12	...	...
Mt. Sir Samuel ...	630	22	...	...
Lawlers	734	59	910	8
Leinster G.M. ...	560	17	...	...
Darda	705	33	...	...
Lake Darlôt ...	...	...	...	...
Duketon ...	577	—	...	...
Salt Soak ...	...	...	...	...
Mt. Leonora ...	821	32	815	7
Mt. Malcolm ...	659	21	820	7
Mt. Morgans ...	755	21	894	7
Burtville ...	...	...	...	...
Laverton ...	1033	28	1117	5
Murrin Murrin ...	592	19	911	6
Yundamindera ...	711	26	...	...
Tampa ...	588	18	...	...
Kookynie ...	847	35	...	...
Niagara	760	29	799	8
Yerilla	896	29	846	7
Quandinnie ...	692	34	...	...
Edjudina ...	786	34	...	...
Menzies	681	29	868	8
Mulline	630	43	...	...
Waverley A ...	578	—	...	...
Goongarrie ...	709	43	883	9
Mulwarrie A ...	782	—	...	...
Bardoc	822	36	...	...
Broad Arrow ...	746	40	1012	7
Kurnalpi ...	641	37	935	8
Bulong	694	37	920	8
Kanowna ...	704	49	896	9
Kalgoorlie ...	863	51	967	9
Coolgardie ...	786	58	890	12
Burbanks ...	1106	58	...	...
Woolubar ...	775	43	...	...
Widgemooltha ...	891	60	1062	7
50-Mile Tank ...	849	50	1025	7
Waterdale ...	1042	55	...	...
Norseman ...	975	54	1031	8
Lake View ...	868	65	...	...
Bulla Bulling ...	977	47	902	8
Boondi	952	56	...	...
Boorabbin ...	954	51	966	10
Koorarawalyee ...	1635	56	...	...
Karalee	874	29	1150	7

Stations.	Year, 1905.		Previous Years.	
	No. of points. 100 = 1in.	No. of wet days.	No. of points. 100 = 1in.	No. of Years.
Eastern—*contd.*:				
Yellowdine ...	717	29	981	6
Southern Cross ...	733	36	903	15
Parker's Range ...	926	84	...	...
Parker's Road ...	784	—	...	...
Mount Jackson ...	...	...	933	6
Bodallin	766	41	1156	5
Glenelg Rocks ...	...	...	...	...
56-Mile	...	...	...	..
Emu Rock ...	...	...	...	...
Burracoppin ...	...	...	1085	5
Baandee ...	...	...	...	...
Kellerberrin ...	1282	71	1187	12
Merredin ...	1078	56	...	...
Nangeenan ...	1016	46	...	...
Mangowine ...	1059	6	1121	17
Wattoning ...	...	...	990	8
Noongarin ...	954	46	...	...
163-Mile ...	...	...	...	...
126-Mile ...	...	...	...	...
90-Mile	...	...	...	...
Cowjanup ...	...	...	...	...
Eucla Division:				
Ravensthorpe ...	1490	113	...	...
Coconarup ...	1339	95	1507	6
Hopetoun ...	1784	71	...	...
Fanny's Cove ...	1970	71	2536	5
Park Farm ...	2027	100	2448	5
Esperance ...	2524	113	2508	21
Gibson's Soak ...	1941	100	2117	7
30-Mile Condenser	1592	84	1929	5
Swan Lagoon ...	1638	72	1593	7
Grass Patch ...	...	...	1529	8
Myrup	2289	112	...	...
Lynburn A ...	1894	112	...	...
Boyatup ...	2516	100	...	...
Middle Island ...	...	...	...	...
Point Malcolm ...	1863	114	...	...
Israelite Bay ...	1561	107	1471	20
Balbinia A ...	1084	77	...	...
Frazer Range ...	1019	39	...	...
Balladonia ...	769	55	987	14
Southern Hills ...	1064	32	...	...
Eyre	670	69	1116	20
Mundrabilia B ...	517	55	...	...
Eucla	442	58	1069	21

The Observatory, Perth,
19th January, 1906.

W. E. COOKE,
Government Astronomer.

THE CLIMATE OF WESTERN AUSTRALIA DURING JANUARY, 1906.

The almost continuous heat of December ran well into January, but a radical change occurred on the night of Sunday, the 21st. Immediately preceding this came reports of very high temperatures throughout the State. Nearly every station in the interior recorded maxima from 105deg. upwards, and as the heat wave passed Eastwards, Eucla, on our Eastern boundary, registered 123·2deg., the highest ever recorded there and one of the highest records for Australia. The weather map of Sunday, 21st, indicated the approach of a "low" from the Indian Ocean towards our West coast, and on the arrival of the mail steamer "Moldavia," from Colombo to Fremantle, it was ascertained that she had encountered a severe cyclonic storm on the previous Friday and Saturday and had been compelled to heave to for six hours. It might perhaps be worthy of mention that a severe storm passed the Cocos Islands on the 10th and 11th, travelling towards the South-West. The centre of the storm passed Perth at 8·30 p.m. on Sunday (21st), Cape Leeuwin at 10 p.m., and Breaksea on Monday morning at 2·30 a.m., the lowest barometers being respectively 29·42, 29·20, and 29·13, these being the lowest recorded since October, 1904. On Monday, at 8 a.m., the weather map showed a complete reversion to the winter type, the pressure being very low South of Cape Leeuwin and Breaksea, with a "high" coming on to the West coast near Sharks Bay. The winter type of weather also prevailed, viz., strong North-West gales with driving showers. The disturbance commenced to affect goldfields on Monday forenoon, when terrific dust storms ushered in a cool change. Since then we have been favoured in South-West districts with very mild weather, but heat waves have continued to affect the goldfields, coming through from the North-West, and passing to the other States.

On the whole the atmospheric pressure has been slightly below normal throughout the State. Temperature has been about an average in coastal districts, but throughout the interior it was unusually high, the mean maximum being about 5deg. above the average for previous years on the Coolgardie Fields. That this great heat also passed on to the Eastern States is shown by the fact that the mean maximum at Adelaide was 5·8 deg. above normal, and at Melbourne, 3·5 deg.; and terrific bush fires raged in Victoria for weeks, causing almost unprecedented injury and loss of life.

The rainfall was very patchy, but slightly above the average in South-West and goldfields districts. In the tropics it was on the whole light, especially in the North-West division, but was rather above the average in the neighbourhood of Broome.

The Climate of Western Australia during January, 1906.

	Locality.	Barometer (corrected and reduced to sea-level). Mean of 9 a.m. and 3 p.m.	Average for previous years.	Highest for Month.	Lowest for Month.	Shade Temperatures. January, 1906. Mean Max.	Mean Min.	Mean of Month.	Highest Max.	Lowest Min.	* Average for previous Years. Mean Max.	Mean Min.	Highest ever recorded.	Lowest ever recorded.	Rainfall. Points (100 to inch) in Month.	Wet Days.	Total Points since Jan. 1.
North-West and North Coast:	Wyndham	29·	29·768	29·920	29·	100·0	80·8	90·4	108·2	73·0	96·3	79·3	111·8	69·0	641	12	641
	Derby	29·798	29·787	29·915	29·680	96·8	78·8	87·8	105·4	70·2	96·7	78·4	117·5	70·2	597	11	597
	Broome	29·818	29·771	29·916	29·686	91·4	78·7	85·0	95·2	68·6	93·1	79·0	105·5	68·0	535	8	535
	Condon	29·786	29·776	29·981	29·637	95·3	78·5	86·9	107·2	74·0	94·8	76·2	106·5	65·0	110	4	110
	Cossack	29·762	29·763	29·914	29·631	98·6	80·1	89·4	111·0	65·2	99·5	78·2	113·4	71·8	10	3	10
	Onslow	29·791	29·778	29·935	29·606	97·8	76·3	87·0	111·0	69·0	97·7	73·7	117·0	63·4	80	4	80
	Winning Pool ...	29·771	...	29·969	29·623	105·6	74·8	90·2	115·2	66·0	...	...	...	...	44	2	44
	Carnarvon	29·774	29·833	30·003	...	87·8	72·8	80·3	106·0	65·0	89·5	70·5	113·7	58·2	30	3	30
	Hamelin Pool... ...	29·824	29·827	30·066	29·560	98·7	68·9	83·8	111·0	62·0	98·9	68·7	112·0	51·4	*Nil*	...	*Nil*
	Geraldton	29·883	29·904	30·109	29·496	83·4	65·5	74·4	111·0	57·8	84·0	64·1	111·2	49·8	40	1	40
Inland:	Hall's Creek	29·771	29·821	29·941	29·776	100·0	77·3	88·6	111·0	70·2	97·9	72·9	110·0	50·0	254	11	254
	Marble Bar	...	...	...	...	107·1	80·5	93·8	115·8	73·5	105·8	78·6	116·5	73·0	170	8	170
	Nullagine	29·760	29·752	30·014	29·612	106·0	78·6	92·3	115·2	72·0	102·4	74·6	112·0	63·3	279	8	279
	Peak Hill	29·735	29·761	...	29·57	105·0	80·0	92·5	112·0	69·0	99·2	74·0	111·2	58·6	*Nil*	...	*Nil*
	Wiluna*	29·738	29·770	30·043	29·529	103·4	75·5	89·4	111·2	65·0	99·4	70·6	111·2	56·9	62	5	62
	Cue	29·772	29·808	30·031	29·597	103·7	76·5	90·1	113·8	58·6	101·2	72·9	114·0	54·8	51	4	51
	Murgoo	...	...	...	...	77·8	72·9	86·2	114·5	58·0	...	...	...	...	*Nil*	...	*Nil*
	Yalgoo	29·772	29·822	30·084	29·478	103·5	69·8	86·2	115·0	60·0	99·4	69·0	114·0	54·0	2	1	2
	Lawlers	29·784	29·830	30·141	29·563	101·7	75·6	88·6	111·3	63·2	96·6	71·4	112·7	53·1	228	6	228
	Laverton	29·824	29·858	30·206	29·537	100·0	71·6	85·8	113·1	58·2	95·7	68·7	113·1	53·0	187	6	187
	Menzies	29·816	29·863	30·207	29·616	99·9	70·6	85·2	111·0	58·4	94·6	67·6	113·2	48·0	*Nil*	...	*Nil*
	Kanowna	...	...	...	...	97·0	66·6	81·8	112·5	55·0	...	...	...	...	40	2	40
	Kalgoorlie	29·866	29·904	30·277	29·590	97·8	68·0	82·9	112·0	55·3	92·9	64·0	114·4	47·1	*Nil*	...	*Nil*
	Coolgardie	29·846	29·900	30·241	29·576	96·2	66·6	81·4	113·0	54·4	92·6	62·3	113·3	46·0	41	3	41
	Southern Cross ...	29·850	29·879	30·220	29·540	98·1	64·9	81·5	111·4	54·0	94·9	62·5	114·7	44·0	3	3	3
	Kellerberrin	...	...	...	...	...	...	...	...	...	...	...	...	...	107	2	107
	Walebing*	...	...	...	...	94·0	63·2	78·6	108·2	53·0	92·2	61·5	109·7	49·4	50	2	50
	Northam*	...	...	...	...	94·8	63·9	79·4	110·3	53·5	93·5	61·1	111·1	45·4	23	2	23
	York	29·902	29·928	30·213	29·459	93·7	63·9	78·8	108·8	55·1	93·3	60·8	111·0	45·5	19	2	19
	Guildford	...	...	...	...	89·1	63·0	76·0	103·0	47·0	89·3	60·4	109·7	46·8	73	2	73

The Climate of Western Australia during January, 1906—*continued.*

	Locality.	Barometer (corrected and reduced to sea-level). Mean of 9 a.m. and 3 p.m.	Average for previous years.	Highest for Month.	Lowest for Month.	Shade Temperatures. January, 1906. Mean Max.	Mean Min.	Mean of Month.	Highest Max.	Lowest Min.	*Average for previous Years. Mean Max.	Mean Min.	Highest ever recorded.	Lowest ever recorded.	Rainfall. Points (100 to inch) in Month.	Wet Days.	Total Points since Jan. 1.
South-West and South Coast:	Perth Gardens	29·906	29·938	30·148	29·402	88·2	65·2	76·7	101·0	54·0	87·1	62·8	116·7	46·0	81	2	81
	Perth Observatory ...	29·918	29·953	30·152	29·415	84·8	64·7	74·8	99·4	56·5	84·0	62·7	107·0	50·6	80	3	80
	Fremantle	29·951	29·952	30·162	29·536	78·7	65·9	72·3	99·0	57·5	80·4	63·8	105·0	51·8	49	2	49
	Rottnest	29·936	29·940	30·160	29·538	76·4	64·6	70·5	89·2	50·5	77·4	64·0	102·2	52·5	11	2	11
	Mandurah	...	...	...	...	84·7	62·4	73·6	101·9	51·1	...	...	...	...	62	3	62
	Marradong	...	...	...	...	...	...	...	...	...	...	...	...	...	77	3	77
	Wandering	...	...	...	...	88·4	56·4	72·4	102·0	46·1	...	...	...	...	36	2	36
	Narrogin	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
	Collie	...	...	...	...	86·8	56·4	71·6	99·3	47·0	85·8	53·6	103·0	37·7	106	4	106
	Donnybrook*	...	...	...	...	84·8	58·1	71·5	98·2	48·2	84·1	53·9	101·5	41·2	168	3	168
	Bunbury	29·940	29·978	30·193	29·500	80·5	60·5	70·5	95·5	51·2	82·1	58·1	103·1	43·4	101	4	101
	Busselton	...	...	...	...	82·9	56·1	69·5	95·8	48·2	81·6	55·2	99·2	41·0	31	3	31
	Cape Naturaliste ...	29·956	...	30·205	29·491	74·6	60·2	67·4	84·0	53·2	...	...	...	...	58	7	58
	Bridgetown	...	...	...	...	85·1	54·8	70·0	97·7	43·0	84·6	50·8	102·5	34·1	110	5	110
	Karridale	29·975	30·013	30·12	29·56	77·0	58·0	67·5	86·0	50·0	75·5	57·0	99·6	42·3	145	6	145
	Cape Leeuwin	29·95	29·986	30·23	29·20	76·0	64·0	70·0	81·0	58·0	72·8	61·8	91·6	51·0	94	10	94
	Katanning	29·926	29·958	30·250	29·461	89·3	57·8	73·6	104·5	48·0	87·0	54·6	108·7	42·0	17	1	17
	Mt. Barker	...	...	...	...	81·9	55·4	68·6	95·8	43·0	...	...	...	...	52	6	52
	Albany	29·957	30·010	30·298	29·449	75·3	58·8	67·0	89·2	48·5	72·8	57·1	101·2	42·3	59	10	59
	Breaksea...	29·960	30·000	30·306	29·187	71·6	61·5	66·6	80·2	56·0	69·2	59·0	91·6	46·8	55	11	55
	Esperance	29·970	29·996	30·300	29·594	80·2	61·9	71·0	108·8	50·8	77·6	59·1	114·3	40·2	9	2	9
	Balladonia*	29·938	29·949	30·319	29·520	90·0	60·1	75·0	109·0	50·2	87·5	57·4	111·2	42·6	22	5	22
	Eyre	29·908	29·982	30·242	29·510	82·8	61·2	72·0	116·5	44·8	78·3	58·8	112·0	41·5	235	5	235
INTERSTATE.																	
	Perth	29·918	29·953	30·152	29·415	84·8	64·7	74·8	99·4	56·5	84·0	62·7	107·0	50·6	80	3	80
	Adelaide	29·946	29·937	30·250	29·560	92·4	64·4	78·4	113·1	51·9	86·6	61·7	116·3	45·1	*Nil*	...	*Nil*
	Melbourne	29·942	29·831	30·245	29·473	81·6	56·7	69·2	109·6	45·2	78·1	56·4	111·2	42·0	37	...	37
	Sydney	29·970	29·929	30·270	29·640	78·0	64·0	71·0	91·0	58·0	78·2	64·8	108·5	51·0	221	...	221

* Averages for three years only.

The Observatory, Perth, January, 1906.

W. E. COOKE, Government Astronomer.

RAINFALL for December, 1905 (completed as far as possible), and for January, 1906 (principally from Telegraphic Reports).

Stations.	December. No. of points. 100 = 1in.	December. No. of wet days.	January. No. of points. 100 = 1in.	January. No. of wet days.
East Kimberley:				
Wyndham ...	192	7	641	12
6-Mile	422	10	...	...
Carlton	...	...	...	...
The Stud Station	...	...	...	...
Argyle Downs ...	219	5	...	...
Rosewood Downs	276	8	..	...
Lisadell	...	...	...	...
Turkey Creek ...	168	10	548	13
Ord River ...	...	...	...	...
Alice Downs ...	...	...	...	...
Flora Valley ...	...	...	...	...
Hall's Creek ...	...	...	...	...
Nicholson Plains	...	...	...	...
Ruby Plains ...	...	...	...	...
Denison Downs	...	...	...	...
West Kimberley:				
Mt. Barnett ...	...	...	...	...
Corvendine ...	...	...	...	...
Leopold Downs...	...	...	...	...
Fitzroy Crossing (P.O.)	134	10	331	16
Fitzroy Station ...	...	...	...	...
Quanbun ...	307	4	...	...
Nookanbah ...	144	7	...	...
Upper Liveringa	273	8	...	...
Mt. Anderson ...	...	...	...	...
Yeeda	120	4	...	...
Derby	111	8	597	11
Pt. Torment ...	225	6	...	...
Obagama ...	536	6	...	...
Beagle Bay ...	411	9	...	...
Roebuck Downs	203	6	...	...
Kimberley Downs	217	10	...	...
Broome	315	7	535	8
Thangoo ...	160	3	...	...
La Grange Bay...	59	2	867	15
N.W. Coast:				
Wallal	53	3	253	8
Pardoo	Nil	...	...	...
Condon	82	1	110	4
DeGrey River ...	9	1	...	...
Port Hedland ...	5	2	40	6
Boodarie ...	61	1	...	...
N.W. Coast—*cont.*				
Balla Balla ...	...	...	...	...
Whim Creek ...	Nil	...	104	...
Mallina	35	1	...	...
Croydon	22	2	...	...
Sherlock ...	...	...	...	...
Woodbrook ...	Nil	...	...	...
Cooyapooya ...	19	1	...	...
Roebourne ...	1	1	37	3
Cossack	208	1	10	3
Fortescue ...	Nil	...	16	2
Mardie	Nil	...	...	...
Chinginarra ...	Nil	...	...	...
Yarraloola ...	Nil	...	...	...
Peedamullah ...	23	1	...	...
Onslow	Nil	...	80	4
Point Cloates ...	Nil	...	...	...
N.W. Inland:				
Warrawagine ...	40	1	...	...
Eel Creek ...	...	...	...	...
Muccan	...	...	...	...
Ettrick	37	2	...	...
Mulgie	37	2	...	...
Warralong ...	223	6	...	...
Coongon... ...	172	6	...	...
Talga	...	...	...	...
Bamboo Creek ...	206	10	458	11
Moolyella ...	...	...	...	...
Marble Bar ...	143	14	170	8
Warrawoona ...	360	4	133	5
Corunna Downs	279	8	...	...
Mt. Edgar ...	263	9	...	...
Nullagine ...	128	5	279	8
Middle Creek ...	236	8	...	...
Mosquito Creek	415	8	...	...
Roy Hill... ...	...	...	...	...
Bamboo Springs	...	...	...	...
Kerdiadary ...	233	2	...	...
Woodstock ...	334	8	..	...
Station Peak ...	57	2	...	...
Mulga Downs ...	137	7	...	...
Mt. Florence ...	80	4	...	...
Tambrey ...	193	5	...	...
Millstream ...	201	6	...	...
Red Hill... ...	...	...	...	...
Mt. Stewart ...	...	...	...	...

RAINFALL—*continued.*

Stations.	December. No. of points. 100 = 1in.	December. No. of wet days.	January. No. of points. 100 = 1in.	January. No. of wet days.
N.W. Inland—*cont.*				
Peake Station ...	52	2	...	...
Narratarra ...	...	...	...	...
Yanrey	6	1	...	...
Wagoola... ...	...	...	...	...
Towera	...	...	...	...
Gascoyne:				
Winning Pool ...	16	1	44	2
Coordalia ...	30	1	...	...
Wandagee ...	77	1	...	...
Williambury ...	5	1	...	...
Yanyeareddy ...	10	1	...	...
Maroona ...	...	...	...	...
Ullawarra ...	150	1	...	...
Mt. Mortimer ...	116	2	...	...
Edmunds ...	138	3	...	...
Minnie Creek ...	172	2	...	...
Gifford Creek ...	69	2	...	...
Bangemall ...	50	2	...	...
Mt. Augustus ...	...	...	...	...
Upper Clifton Downs	26	4	...	...
Clifton Downs ...	116	1	...	...
Dairy Creek ...	60	3	...	...
Mearerbundie ...	...	...	...	...
Byro	100	3	...	...
Meedo	Nil	...	...	...
Mungarra ...	51	2	...	...
Bintholya ...	...	...	...	...
Booloogooroo ...	...	...	...	...
Doorawarrah ...	...	...	...	...
Brick House ...	...	...	...	...
Boolathana ...	Nil	...	...	...
Carnarvon ...	Nil	...	30	3
Dirk Hartog ...	...	...	...	...
Shark Bay ...	Nil	...	Nil	...
Wooramel ...	Nil	...	2	1
Hamelin Pool ...	Nil	...	Nil	...
Kararang ...	Nil	...	...	...
Tamala	...	...	...	...
Yalgoo Distict:				
Woolgorong ...	50	2	...	...
New Forest ...	30	1	...	...
Yuion	91	1	...	...
Pindathuna ...	...	...	...	...
Tallyrang ...	Nil	...	...	...
Yalgoo District—*contd.*				
Mullewa ...	8	2	7	1
Kockatea ...	48	3	16	1
Barnong ...	...	...	...	...
Gullewa	...	...	...	...
Gullewa House...	...	...	...	...
Gabyon	13	2	Nil	...
Mellenbye ...	—	—	20	1
Wearagaminda...	81	4	...	...
Yalgoo	48	3	2	1
Wagga Wagga ...	...	...	...	...
Muralgarra ...	68	2	...	...
Burnerbinmah ...	79	3	...	...
Nalbara	...	...	...	...
Wydgee	165	3	...	...
Field's Find ...	178	3	...	...
Rothesay ...	...	...	...	...
Ninghan ...	142	5	Nil	...
Condingnow ...	120	5	...	...
199-Mile ...	121	3	...	...
163-Mile ...	47	6	22	1
Palaga Rocks ...	—	—	153	2
126-Mile ...	101	3	...	...
90-Mile	99	3	...	..
Mt. Jackson ...	...	...	...	...
Murchison:				
Walo	...	...	...	...
Yallalonga ...	Nil	...	...	...
Billabalong ...	12	1	...	...
Twin Peaks ...	58	1	...	...
Murgoo	70	2	Nil	...
Mt. Wittenoom ..	41	2	...	...
Meka	80	3	...	...
Wooleane ...	60	2	...	...
Boolardy ...	54	2	...	...
Woogorong ...	1	...	...	...
Manfred ...	110	3	...	...
Yarra Yarra ...	71	2	...	...
Milly Milly ...	103	3	...	...
Berringarra ...	97	4	...	...
Mileura	126	4	...	...
Mt. Gould ...	82	2	...	...
Moorarie ...	80	2	...	...
Wandary ...	...	...	...	...
Peak Hill ...	125	3	Nil	...
Mt. Fraser ...	...	...	...	...
Abbotts	85	2	Nil	...
Belele	...	...	...	...

RAINFALL—*continued.*

Stations.	December. No. of points. 100 = 1in.	December. No. of wet days.	January. No. of points. 100 = 1in.	January. No. of wet days.
MURCHISON—*contd.*				
Meekatharra ...	...	...	...	...
Star of the East	105	—	Nil	...
Nannine	69	4	Nil	...
Annean	189	4	Nil	...
Tuckanarra ...	135	2	Nil	...
Coodardy ...	100	2	135	2
Cue	108	3	51	4
Day Dawn ...	78	2	70	3
Lake Austin ...	57	2	47	3
Lennonville ...	39	2	3	2
Mt. Magnet ...	44	2	13	3
Youeragabbie ...	92	2	Nil	...
Murrum	120	2	...	...
Challa	55	2	41	3
Nunngarra ...	77	4	Nil	...
EAST MURCHISON:				
Gum Creek ...	105	4	9	1
Dural	42	3	...	...
Wiluna	76	5	62	5
Mt. Sir Samuel ...	67	4	252	3
Leinster G.M. ...	101	2	...	...
Lawlers	45	7	228	7
Lake Darlôt ...	...	...	...	...
Darda	16	5	...	...
Salt Soak ...	52	2	...	...
Duketon ...	35	1	...	...
NORTH COOLGARDIE GOLDFIELDS:				
Burtville ...	...	...	...	...
Laverton ...	107	2	187	6
Mt. Morgans ...	46	1	86	1
Murrin Murrin...	66	2	119	3
Mt. Malcolm ...	31	2	213	3
Mt. Leonora ...	24	1	139	3
Tampa	79	3	124	2
Kookynie ...	69	3	39	3
Niagara	29	2	52	4
Yerilla	146	3	85	3
Yundamindera ..	24	2	146	3
Mt. Celia ...	...	...	...	...
Edjudina ...	65	2	Nil	...
Quandinnie ...	133	2	...	...
Menzies	71	3	Nil	...
Mulline	55	2	115	3
Mulwarrie ...	151	2	42	4
Goongarrie ...	115	3	132	3

Stations.	December. No. of points. 100 = 1in.	December. No. of wet days.	January. No. of points. 100 = 1in.	January. No. of wet days.
COOLGARDIE GOLDFIELDS:				
Waverley ...	...	...	...	...
Bardoc	194	3	25	2
Broad Arrow ...	175	2	10	1
Kanowna ...	140	3	40	2
Kurnalpi ...	89	2	39	2
Bulong	124	2	15	1
Kalgoorlie ...	257	2	Nil	...
Coolgardie ...	120	4	41	2
Burbanks ...	154	4	46	2
Bulla Bulling ...	279	3	2	1
Woolubar ...	248	5	81	2
Waterdale ...	267	4	133	2
Widgiemooltha...	169	4	45	2
50-Mile Tank ...	200	4	152	3
Norseman ...	235	6	55	4
Lake View ...	349	3	48	1
Frazer Range ...	168	4	...	...
Southern Hills ...	150	2	...	...
YILGARN GOLDFIELDS:				
129-Mile	194	6	...	...
Emu Rocks ...	...	...	...	...
56-Mile	90	1	...	...
Glenelg Rocks ...	110	4	...	...
Burracoppin ...	137	5	...	...
Bodallin ...	115	3	...	...
Parker's Road ...	141	—	...	...
Southern Cross ...	105	2	3	3
Parker's Range...	159	7	16	5
Yellowdine ...	125	2	9	1
Karalee	105	2	Nil	...
Koorarawalyee ..	207	4	...	...
Boorabbin ...	262	3	Nil	...
Boondi	272	3	14	1
SOUTH-WEST (NORTHERN DIVISION):				
Murchison House	12	1	...	...
Mt. View ...	Nil	...	...	...
Mumby	—	—	67	1
Northampton ...	61	2	80	1
Chapman Experimental Farm...	34	1	36	1
Narra Tarra ...	...	...	...	...

RAINFALL—*continued.*

Stations.	December. No. of points. 100 = 1in.	December. No. of wet days.	January. No. of points. 100 = 1in.	January. No. of wet days.
SOUTH-WEST (NORTHERN DIVISION)—*contd.*				
Oakabella ...	75	1	...	...
White Peak ...	75	1	...	...
Geraldton ...	96	6	40	1
Hinton Farm ...	93	—	50	—
Tibradden ...	38	2	...	...
Myaree	34	3	39	1
Sand Springs ...	25	1	...	...
Nangetty ...	69	2	8	1
Greenough ...	90	1	30	1
Bokara	84	6	55	1
Dongara ...	73	2	32	1
Strawberry ...	...	...	...	...
Yaragadee ...	...	...	...	...
Urella	57	1	14	1
Opawa	48	2	...	...
Mingenew ...	82	4	27	1
Yandenooka ...	66	1	...	...
Carnamah ...	91	3	17	2
Watheroo ...	133	2	...	...
Nergaminon ...	84	4	23	2
Dandaragan ...	183	3	37	1
Yatheroo ...	124	2	...	...
Moora	141	3	19	1
Walebing ...	185	6	50	3
Round Hill ...	225	6	23	1
New Norcia ...	182	5	45	3
Wongon Hills ...	...	...	...	...
Wannamel ...	130	4	33	1
Gingin	136	3	43	3
SOUTH-WEST (METROPOLITAN):				
Wanneroo ...	60	2	...	...
Belvoir	62	2	47	2
Wandu	69	6	77	4
Mundaring ...	108	2	108	2
Canning Waterworks	95	3	...	...
Kalbyamba ...	95	2	...	...
Guildford ...	66	2	73	2
Perth Gardens ...	70	4	81	2
Perth Observatory	77	5	80	3
Highgate Hill ...	65	2	85	2
Subiaco	55	4	77	2
Claremont ...	..	...	...	...
Fremantle ...	53	5	49	2
SOUTH-WEST (METROPOLITAN)—*cont.*				
Rottnest	30	4	11	2
Rockingham ...	24	2	34	1
Jandakot ...	57	2	134	3
Armadale ...	73	2	...	...
Mundijong ...	91	4	108	4
Jarrahdale ...	148	4	235	4
Jarrahdale (Norie)	110	4	...	...
Serpentine ...	53	3	95	4
EXTREME SOUTH-WEST:				
Mandurah ...	67	3	62	3
Pinjarra (Blythewood)	100	2	90	4
Pinjarra	100	2	82	3
Upper Murray ...	151	5	130	4
Yarloop	87	3	105	4
Harvey	82	4	118	3
Brunswick ...	60	3	110	2
Collie	76	4	106	4
Glen Mervyn ...	81	4	...	...
Donnybrook ...	60	3	168	2
Boyanup ...	74	3	...	...
Bunbury ...	40	4	101	4
Busselton ...	13	4	31	3
Quindalup ...	37	4	...	...
Cape Naturaliste	53	3	58	6
Glen Lossie ...	87	6	59	8
Karridale ...	93	5	145	6
Cape Leeuwin ...	89	8	94	10
Lower Blackwood	52	2	111	4
Ferndale ...	...	...	...	...
Greenbushes ...	56	3	139	3
The Peninsula ...	...	...	...	...
Bridgetown ...	66	6	110	5
Hilton	...	...	...	...
Greenfields ...	70	4	111	4
Cundinup ...	57	3	45	2
Wilgarup ...	50	2	139	6
Balbarrup ...	53	4	...	...
Bidellia ...	85	2	...	...
The Warren ...	...	...	...	...
Westbourne ...	79	3	...	...
Deeside	47	4	...	...
Riverside ...	75	6	...	...
Mordalup ...	65	2	...	...
Lake Muir ...	75	4	...	...

RAINFALL—*continued.*

Stations.	December. No. of points. 100 = 1in.	December. No. of wet days.	January. No. of points. 100 = 1in.	January. No. of wet days.
Eastern Agricultural Districts:				
Emungin ...	153	8	...	...
Dowerin ...	100	3	42	2
Warramuggin ...	...	...	...	...
Monglin	...	...	...	...
Hatherley ...	158	5	..	...
Momberkine ...	5	5	20	1
Eumalga ...	213	6	39	1
Newcastle ...	35	2	23	1
Craiglands ...	156	3	...	...
Eadine	180	8	31	3
Northam ...	139	5	23	2
Grass Valley ...	166	3	10	1
Cobham	177	6	37	3
York	208	6	19	2
Yenelin	...	...	...	...
Meckering ...	132	6	89	2
Cunderdin ...	...	...	...	...
Doongin	67	4	...	...
Whitehaven ...	89	2	...	...
Mt. Caroline ...	106	3	34	2
Cutenning ...	103	4	...	...
Kellerberrin ...	91	3	36	3
Cardonia ...	85	2	...	...
Baandee ...	110	3	107	2
Nangeenan ...	95	3	Nil	...
Merredin ...	126	3	20	1
Codg-Codgen ...	—	—	67	5
Noongarin ...	93	4	...	...
Mangowine ...	60	4	32	2
Yarragin ...	76	4	...	...
Wattoning ...	...	...	...	...
Great Southern Railway Line:				
Dalebridge ...	116	3	...	...
Beverley ...	143	4	...	...
Brookton ...	174	2	...	...
Sunning Hill ...	140	7	60	2
Pingelly ...	170	6	35	2
Yornaning ...	160	7	41	3
Narrogin ...	114	6	34	4
Narrogin Experimental Farm	122	7	...	...
Wagin	155	3	11	1
Katanning ...	177	5	17	1
Sunnyside ...	96	5	...	...
Broomehill ...	74	3	15	1
Great Southern Railway Line—*contd.*				
Woolgarup ...	65	4	13	2
Pallinup	...	...	...	...
Tambellup ...	182	4	...	...
Toolbrunup ...	130	4	...	...
Cranbrook ...	95	4	34	3
Stirling View ...	—	—	—	—
Kendenup ...	97	4	32	2
Woogenellup ...	68	5	...	...
Wattle Hill ...	95	12	90	10
St. Werburgh's ...	100	7	53	6
Mt. Barker ...	104	9	52	6
West of Great Southern Railway Line:				
Talbot House ...	132	2	...	...
Jelcobine ...	212	7	21	2
Bannister ...	124	5	...	...
Wandering ...	389	6	36	2
Glen Ern ...	140	6	22	2
Marradong ...	76	3	77	3
Wonnaminta ...	116	5	...	...
Williams ...	162	5	26	2
Rifle Downs ...	...	...	...	...
Darkan	...	...	...	...
Arthur River ...	75	3	26	1
Glenorchy ...	80	2	...	...
Kojonup ...	58	3	56	3
Blackwattle ...	—	—	47	2
Warriup ...	—	—	—	—
Forest Hill ...	155	11	...	...
East of Great Southern Railway Line:				
Sunset Hills ...	140	4	...	...
Oakdale	140	5	160	3
Barrington ...	154	4	88	2
Bally Bally ...	120	6	...	...
Stock Hill ...	100	1	33	1
Qualin	116	3	20	1
Woodgreen ...	—	—	—	—
Gillimanning ...	153	4	...	...

RAINFALL—*continued.*

Stations.	December. No. of Points. 100 = 1in.	December. No. of wet days.	January. No. of Points. 100 = 1in.	January. No. of wet days.
EAST OF GREAT SOUTHERN RAILWAY LINE—*cont.*				
Wickepin ...	...	...	...	...
Crooked Pool ...	121	5	40	3
Bunking ...	173	4	...	...
Bullock Hills ...	182	4	...	...
Dyliabing ...	138	5	...	...
Glencove ...	136	4	35	2
Cherillalup ...	143	5	...	...
Mianelup ...	79	6	...	...
Woolganup ...	85	3	...	...
Chillinup ...	68	2	...	...
Jarramongup ...	114	3	...	...
SOUTH COAST:				
Wilson's Inlet ...	105	9	54	8
Grasmere ...	116	7	63	9
King River ...	93	3	...	...
Albany	169	12	59	10
Point King ...	126	4	66	7
Breaksea ...	140	3	55	11

Stations.	December. No. of Points. 100 = 1in.	December. No. of wet days.	January. No. of Points. 100 = 1in.	January. No. of wet days.
SOUTH COAST—*cont.*				
Cape Riche ...	77	5	...	...
Peppermint Grove	87	6	60	6
Bremer Bay ...	91	6	36	4
Coconarup ...	129	4	24	3
Ravensthorpe ...	125	6	24	6
Hopetoun ...	133	5	19	4
Fanny's Cove ...	78	4	...	...
Park Farm ...	127	3	...	...
Grass Patch ...	114	—	...	...
Swan Lagoon ...	131	3	...	...
30-Mile	125	3	...	...
Gibson's Soak ...	140	3	...	...
Myrup	103	2	25	2
Esperance ...	132	2	9	2
Boyatup	156	3	...	...
Lynburn ...	116	3	...	...
Middle Island ...	88	1	...	...
Point Malcolm ...	135	4	...	...
Israelite Bay ...	123	3	34	4
Balbinia	...	...	...	...
Balladonia ...	158	3	22	5
Eyre	21	2	235	5
Mundrabillia ...	...	...	...	...
Eucla	6	2	211	5

The Observatory, Perth,
9th January, 1906.

W. E. COOKE,
Government Astronomer.

By Authority: A. CURTIS, Acting Government Printer, Perth.

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OF

WESTERN AUSTRALIA.

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EDITOR'S NOTES.

INSECT PESTS ACT.—In this issue will be found published the amended regulations of the Insect Pests Act which came into force last month.

UNDER SECRETARY FOR AGRICULTURE.—The Director of Agriculture, Mr. C. T. Chaplin, has been appointed Under Secretary for Agriculture in addition to the position previously held.

RAPE FOR SHEEP.—At Brushy Hill, in the Scone district, 100 acres of land that five years ago was scrub and prickly-pear infested has been put under rape. For several months past the area has been fattening some 20 sheep to the acre.—*Sydney Mail.*

WORMS IN PIGS.—Pigs are often troubled with worms, which seriously interfere with them putting on flesh. A very good remedy is the following:—Iron sulphate 1 dram, copper sulphate 1 dram, common salt 4ozs.; mix well, and give one teaspoonful for each pig in their food once a day for 12 days.

TOBACCO FOR SPRAYING.—In many cases of plant diseases caused by attacks from aphides and other insects, spraying with a decoction of tobacco, or shaking tobacco dust over and around the plants, has proved to be efficacious. In order to encourage the eradication of these pests, the

Director of the Department of Agriculture will supply small quantities of tobacco free on application being made for same stating the purpose it is to be used for.

Preventing Smut in Wheat.—For the last five years experiments have been conducted in treating seed wheat for stinking smut with formalin. The wheat produced from treated seed was practically free from smut, while that from untreated seed averaged nearly four per cent. of smutted heads. The treatment, which is very simple, cheap, and effective, consists of the immersion of the seed-wheat for 20 minutes in a solution made by adding one pint of formalin to 42 gallons of water.

Exporting Apples.—With reference to the prizes of £10 10s. offered by the Hon. the Minister for Agriculture, arrangements have been made to send consignments from fourteen growers, consisting of ten cases each, to be despatched by the s.s. "Mongolia." The apples will be sold by auction in open competition at Covent Garden Market, London, so that a comparison may be made between the prices received for the Western Australian product and that received from the Eastern States.

Holstein-Friesian Cows for Dry Climates.—Mr. A. B. Hulit, writing to *Hoard's Dairyman*, mentions the curious fact that in Mexico the most popular dairy cow is the Holstein-Friesian. They fetch prices as high as £40, £50, or £60. Mr. Hulit's firm have imported for their own use over 200 of them, and there are at least 20 towns in Mexico that have received or would receive as many more each. No attempt is made to breed the Holsteins there, all the herds being replaced from the United States. Milk is worth 2s. 6d. a gallon, and lucerne hay costs £8 a ton.

Royal Agricultural Society's Annual Show.—At a meeting of the committee held recently it was decided to commence the next show on Tuesday, October 30, and to continue until the following Saturday (November 3). Arrangements are to be made for stock to enter the grounds as last year, and to remain until the Thursday evening. Special attractions, in the form of substantial prizes for hunters, high-jumping, trotting, etc., will be added to the already liberal programme, and the half holiday on Saturday will allow a large number to attend who have hitherto been prohibited.

Salt Lick for Cattle.—Over the greater portion of this State there is a large deficiency of lime salts, and it is for this reason that grazing stock need to be given a change of feeding country, or fed artificially with food containing the necessary proportion of mineral salts. In cases where a change of feeding ground cannot be made a lick of lime and salt should always be provided, a recipe for which appeared on page 2 of the January issue of the *Journal*. A little loose meal placed in troughs near to the drinking water is a good thing. Cows in milk require to be fed with bran and chaff, with a little salt and treacle added, at least once a day.

Exporting Honey.—Arrangements are being made to forward a trial shipment of honey to England. In a recent issue of the *Journal* it was stated that honey realised as much as 6d. per lb. on the home market. Providing that the honey to be forwarded is of a good quality, our bee-keepers will reap a rich reward for their stocks, which for the last two years have been accumulating. Mr. J. Sutton, the late bee expert to the Department of Agriculture, has taken considerable interest in this matter by corresponding and forwarding samples of honey to merchants in England. He often gave it as his opinion that a good trade was to be done with the European market, providing that only the best honey was sent.

Adulteration of Sulphate of Copper.—When purchasing sulphate of copper, known as blue vitriol, or blue-stone, care should be taken to demand a product of 98 per cent. purity. The usual adulterant of suphate of copper is sulphate of iron, which is much cheaper. An easy test for the presence of iron in the sulphate of copper is to dissolve a little in water and add ammonia, with constant stirring, until a blue liquid forms; any quantity of brown flocks floating about in this blue liquid indicates the presence of so much iron, and the material should be subjected to a proper analysis previous to rejection. Adulterated blue-stone is useless for making Bordeaux mixture.

Angora Goats.—Some idea of the importance of the Angora goat industry in America may be gathered from the following announcement:—The dates for the Angora goat show at Kansas City are 17th to 21st October. The secretary says: "This year we will have a bigger and better show. The 'crowd' are coming from California, from Texas, and from the North-west. They were not here last year; but they know about the Kansas City sales this year, and have notified us they intend coming. We will have buyers from all parts of the world, as this is becoming a recognised centre, and the goat sales are getting a world-wide reputation. . . . The herd-book has got a good start, and pedigrees will count."

To keep Pigs Healthy.—It is well known that swine are the healthiest and do best when given plenty of exercise, and kept in sanitary surroundings. The hog in a state of nature is a clean animal, feeding on grass and herbs, and having his lair in some secluded, well-drained spot. He also is careful about his domestic habits—a strange contrast to the degraded creatures which are so often found shut up in filthy pens by indifferent owners. Where such conditions prevail it is not surprising to find swine fever a dreaded scourge. If these same animals were given the run of a large pasture, fever would soon disappear, and they would become healthy, contented animals, paying a handsome profit to the owner. There is no part of the country where some grazing crops cannot be had throughout the greater part of the year.

Serious Sheep Losses.—A report from Molong states: A large number of stock from different parts of the district have died recently, apparently through eating the dried carcases of rabbits which have been

poisoned with phosphorous and arsenic. Mr. George Bruce, of Loombah, lost a stud ram valued at 250 guineas, also a number of valuable breeding ewes, from this cause. At Mrs. J. Withers', Tarrabandra, some 20 cross-bred sheep in healthy condition and on good pasture died mysteriously during the past week. The stock inspector held a post-mortem examination on some of the carcases, and held that they had died from eating the remains of poisoned rabbits, pieces of the carcase and fur being found in the stomach. The rabbits had been poisoned with patent phosphorous preparations, and had been slaughtered in large numbers. The sheep were almost fit for the market.

BROOME GRASS.—This grass, known botanically as *Bromus inermia*, is also sometimes called smooth, awnless, Hungarian, or Australian Broome grass. It is a vigorous, hardy perennial, with strong creeping root stocks, and smooth upright leafy stems one to four feet high, having loose open pamiles four to eight inches long. It is valuable for both pasturage and hay. The experience with this grass, together with the extended cultural tests made, show that it has remarkable drought-resisting qualities, and is a very suitable grass for dry regions. It will thrive on extremely poor, sandy soil, and will return a fair crop; on good soil, however, it will grow rapidly, producing an abundance of pasture, yielding from one to four tons of hay per acre, and in some cases becomes a nuisance by its active growth and spreading propensities. Once established, it will adapt itself to various climatic conditions, and will withstand both frost and drought. Its advantages over the native grasses are that it becomes green fully a month earlier, and does not dry up in the summer. The seed should be sown broadcast at the rate of 18 to 20lbs. to the acre so soon as the ground can be got into good tilth after the first rains.

CHAPMAN EXPERIMENTAL FARM.—Mr. Chapman, the Director of Agriculture, who has just returned from a trip to the Government Experimental Farm at the Chapman, in a report, states that, owing to the increasing number of applications for admission to the Chapman Experimental Farm, it was intended to extend the cultivable area, and to that end clearing was about to be commenced. It had also been decided to experiment with malting barley, and to put in about 10 acres of cotton. "Some of the artificial grasses which have been experimented with in small plots," said Mr. Chapman, "more particularly sheep's burnet and paspalum virgatum, give evidence of being able to sustain themselves through the dry months, the former showing itself to be a vigorous rooter, going into the hard ground for a considerable depth. The stock are looking well, especially the sheep and Angora goats. Of the latter, there is a flock of 50, and last year we got 15 kids, including 10 bucks, which are now four months old. These will be for sale in a couple of months. It is noteworthy that the Angora feeds only on the natural shrubs. The wheat has yielded fairly well, the two best varieties being the jade and alpha. There are now eight students at the Chapman Farm, and we are making provision to accommodate another eight or nine. In this respect, the Chapman and Narrogin Farms are doing a very useful work, for they enable new arrivals having a little capital to get an insight into local conditions, and then, after about a year's service, to go on the land with every prospect of success."

Cow-testing.—Testing cows for the quantity and quality of their milk yield is coming more and more into vogue. If a dairyman keeps a record of this kind he will find at the end of the year that some of his cows have done remarkably well and paid handsomely, while others have been a dead loss; and the natural inference is that if all our cows were as good as the best ones, there would be a tremendous improvement in general results. Of course, the inquiry naturally arises, What are we to do with the inferior animals? Apart altogether from the legal or moral aspect of the matter, there will be a considerable difficulty in disposing of an inferior cow. She probably cost as much as a good one to buy, but if sent to the market on being drafted out, the possible buyers immediately suspect that there must be something wrong when a dairy farmer wants to sell an apparently good and sound cow, and offer a price accordingly. It is all very well to say that a farmer should test his cows and get rid of the inferior ones, but what is he to do with such? Fattening off is suggested, but a cow in calf does not suit this, and if you wait till she calves again, she is in milk, ready to begin the cycle once more. The best outcome of this testing will be in development by breeding. If we use a bull from approved milking stock and save the calves only from the best mothers, then, in course of time, the general quality of our cows would be improved.

Oilcake *v.* Artificial Manures.—A note in the last number of the *Journal of the Board of Agriculture* calls attention to the tendency of modern ideas on the above subject. At one time it was believed and taught that the best way to improve the land was to feed the animals heavily with cake, and then their enriched dung would get up the condition of the soil accordingly. Dung from good feeding is, of course, more valuable than that from poorly fed animals, but as a method of getting up the fertility of the land it is a very expensive and roundabout way of doing it. Experiment after experiment—to take one case—with sheep fed on pasture has shown that these often fatten better on grass manured with artificials, costing less than a pound per acre, than were heavily fed with cake on land left unmanured. Cake thus consumed direct on the land gives the utmost benefit, but with other kinds of stock there is a fearful waste. Lawes and Gilbert put this waste between the value of fresh dung, and after it had wasted in a heap for awhile, at 50 per cent., and a lot more was wasted again when put on the land before the plants could utilise it. Most soils have plenty of nitrogen and potash and everything else needed to grow a full crop, excepting phosphates, and the application of these alone will give good crops, and at much less cost than from dung enriched by feeding. In using dung, of course, more especially in the case of arable land, one must not forget its value in improving the texture of the soil; but it is quite possible to overvalue this feature. Part of the great success resulting from the use of basic slag is due to the fact that it is phosphoric acid, and phosphoric acid only, that is needed to stimulate the soil, as everything else is present; and cake-fed manure contains a lot of fertility that is not needed.

RAISING PIGS FOR BACON.

Mr. J. G. Hutton, the well-known bacon curer, opened a factory in this State at Fremantle on the 16th inst., while Mr. Farmer, of Ballarat, Victoria, another well-known bacon manufacturer, is also contemplating the erection of a factory in Perth. With the establishment of these factories a new era in the pig raising industry in this State will be inaugurated.

Farmers hitherto, while realising that there was good profit in pigs, complained of a want of a reliable marketing medium. This will now be met in the direction indicated, and pig breeding should become one of the most valuable collateral industries of the farm, especially if farmers will take care to raise the right kind of pig.

Mr. Farmer stated that the class of pig at present being reared in this State was not altogether the kind most suitable for bacon purposes. He considered that something should be done towards the improving the type of pig to meet the requirements of the local market. In this regard he considered that the best pig could be obtained by crossing the Poland China and Berkshire breeds of swine. If Poland China pigs could not be readily obtained, Mr. Farmer counselled the use of pure bred Berkshires alone.

There are other breeders who prefer Berkshires, while Mr. Hutton, a member of the well-known firm of bacon curers who has commenced operations in this State, stated that the "Large Black," when properly, fed made a good bacon pig, but to meet the demands of local tastes probably the "Large Black" would become too big before it could be fattened to the desired weight, hence it may be desirable to cross this animal with the Berkshire pig. And here it may be laid down as a first guide that the whole secret lay in the feeding. Whether the farmer goes in for a pure bred pig or a first cross, in order to get the right sized pig, everything depends on the feeding.

The pig required for curing purposes should not exceed 110 to 130 pounds weight. The flesh must be firm and well streaked, while the fat should possess whiteness and firmness of character.

A short description of the three breeds mentioned will, perhaps, help the intending breeder to decision.

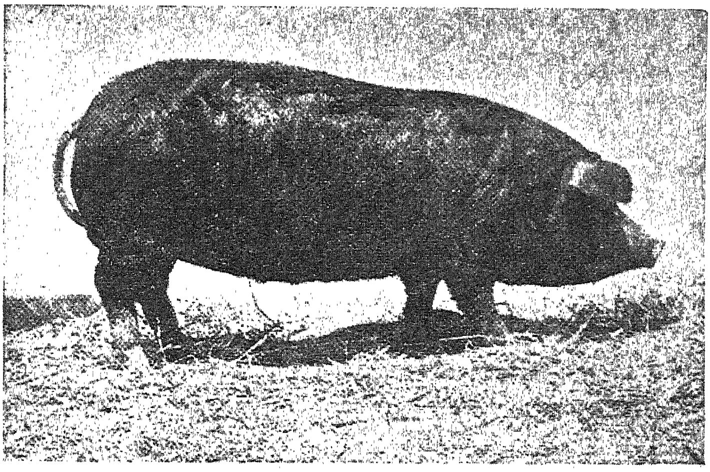
THE POLAND CHINA.

This breed originated from a painstaking series of crosses made by prominent breeders in the United States. The original type of the pig is somewhat different to that known to-day; previously it was much larger, and not so fine in quality. Although bred much smaller at present, yet they retain a size commensurate with quality and early maturity, being equal to any other of the medium breeds. In feeding, they require rich food and plenty of it, and when turned out it must be done on good pastured

land. They make the best headway in the corn and maize growing districts; they are especially suitable for producing a good quality of tender meat with fine grain. In all cases the fat predominates the lean, and for this reason, together with their aptitude for maturing quickly, they are greatly in demand for bacon purposes. They have been used to some extent for

Poland China Boar, "Penates."

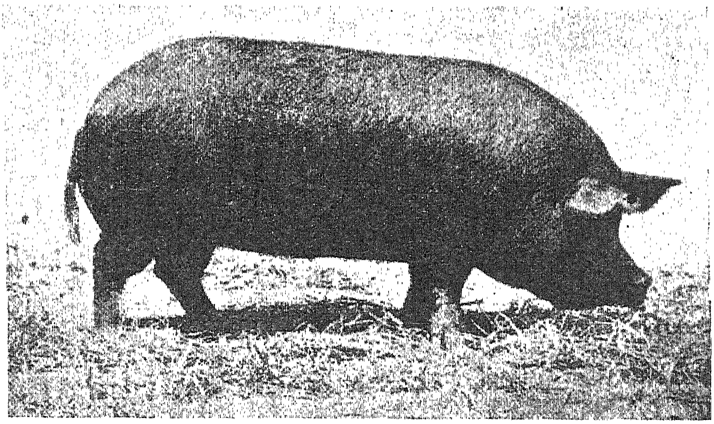
crossing with common pigs with a view of obtaining early maturing and quickly-fattening abilities. They range from 250lbs. at nine to 12 months, and often turn the scale at six and seven hundred pounds when matured.



Poland China Sow, "Sylvia."

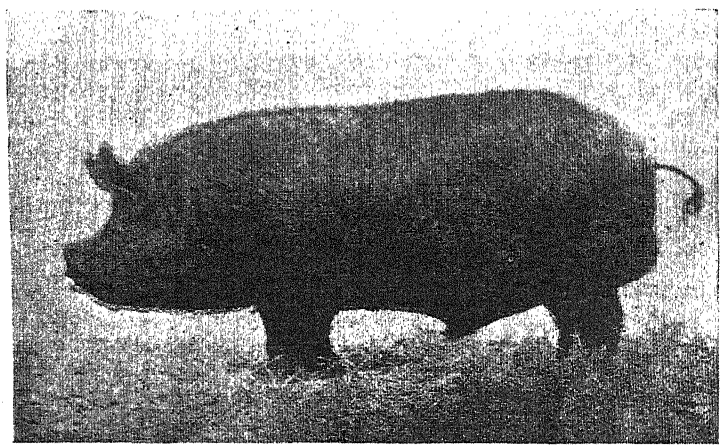
BERKSHIRES.

The Berkshire has been found to be the best breed of pig that thrived well in most parts of Australia, hence it is to be met with almost everywhere the swine industry holds sway. It is a good doer, matures readily, and is fit to kill early in life, while the quality of its flesh is such that it has earned

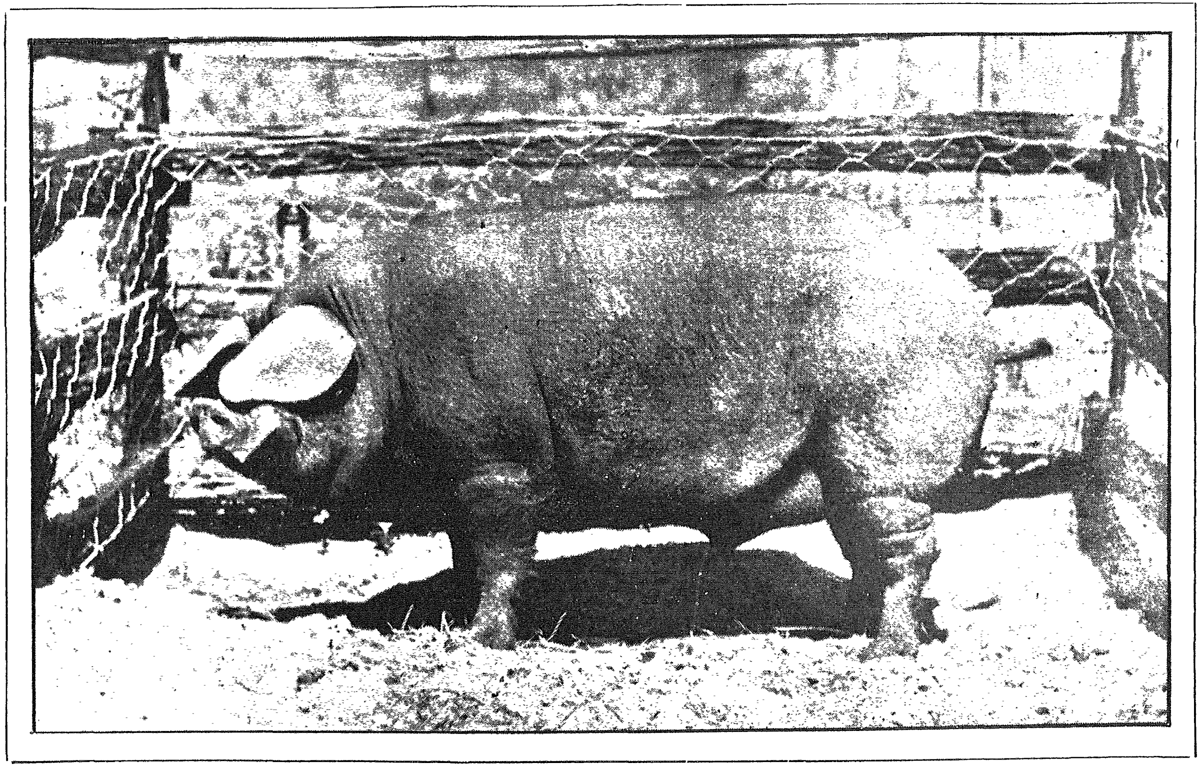


Berkshire Sow, "Shaftesbury Belle."

the esteem of the killers for the fresh meat market, as well as the curers of bacon and hams. To dwell upon the virtues of the Berkshire pig would be to perform an entirely unnecessary task, for its characteristics are well known in almost every locality where the grunt of the pig is heard; but it is not out of place to sing its praises in brief manner, for to neglect doing so would be to do an act of injustice to the king of the swine family. At nine months they go from 250 to 300 pounds, and up to 650 pounds when full grown.



Berkshire Boar, "Burton Tostie," in good working condition.



Imported Large Black, "Australia."

GOOD POINTS OF THE BERKSHIRE.

1st.—Great muscular power and vitality, which render them less liable to disease than any other breeds.

2nd.—Activity, combined with strong digestive and assimilating powers; hence they return a maximum amount of flesh and fat for the food consumed.

3rd.—The sows are unequalled for prolificacy, and as careful nurses and good suckers.

4th.—The pigs are strong, smart, and active at birth, and consequently are less liable to mishaps.

5th.—They can be fattened for market at any time, while they may be fed to any reasonable weight desired.

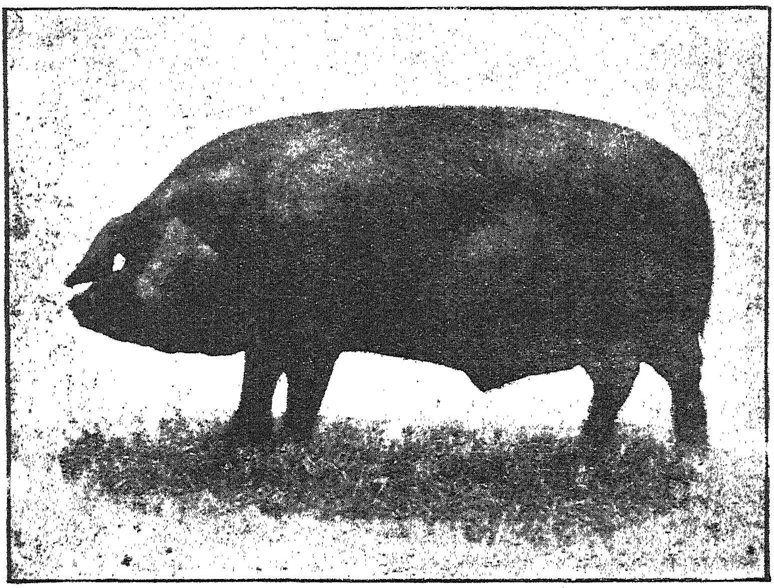
6th.—Their flesh, though very fat, is the highest quality of pork.

7th.—Power of the boar to transmit the valuable qualities of the breed to his progeny more strongly than any other breed.

8th.—Their unsurpassed uniformity in colour, marking, and quality.

"LARGE BLACK" PIGS.

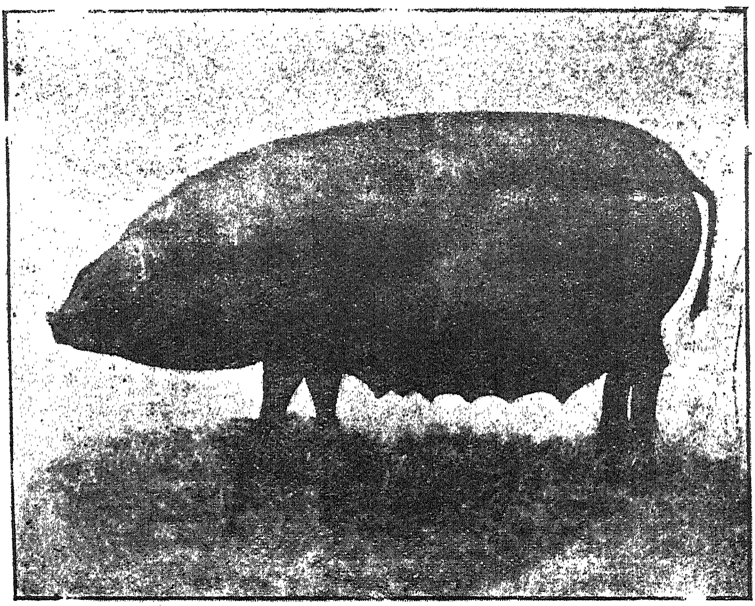
Although, in a strict sense, the "Large Black" breed of pigs cannot be called a new breed, yet the term is not altogether inappropriate, as it is only since the organisation of the "Large Black" Pig Society, a year or two ago, that this breed has become known outside a comparatively circumscribed



William the Conqueror, 163.

area. The "Large Blacks" came with the reputation of being hardy and vigorous, very prolific, and of a contented and good-tempered disposition. The boar and sow illustrated in this issue are well-known English prize winners, and are both represented in a boar and sow that have recently been imported into this State by Messrs. Richardson Bros., of Wooroloo. The sow, previous to despatch, was served by "Iford Masterpiece," another boar with an excellent show record.

The following is from a recent copy of the *Farm and Home*:—"The Large Black pig is a breed that is not at present kept largely in the pure state, but which is growing in popularity, and boasts a society and a herd-book specially devoted to its improvement. The secretary of the society is Mr. Ernest Prentice, of Ipswich, and, from a description written by him, we learn that the antiquity of the breed is beyond doubt, for there is ample evidence that the Large Black pig, with its characteristic whole colour, length, fine hair, 'lop ear,' and great grazing capacity, existed in many parts of the kingdom at a date long prior to the memory of any of the present generation of breeders. They have been continuously and carefully bred in Cornwall for upwards of 50 years, and for long periods in Devon, Essex, and Suffolk, while recently they have extended their district to Yorkshire, North Wales, and Sussex.



Trescowe Scot, 568.

"With herds spread over so great an area, observes Mr. Prentice, and—in the absence of an association of breeders and the consequent herd-book—dependent on near neighbours for any change of blood in boars or sows, it is not surprising that there should be slight variations of type apparent

between the stock of widely separated districts, but the difference is at the outset so slight that it may safely be predicted that the course of very few years will witness general uniformity. The west-country pigs possess the greater frame, whereas those of the eastern district are possibly more hardy and prolific, and the exchange of blood which is likely to result must be of immense benefit to both parties. A breed which has weathered the storm of agricultural distress, and is to-day found to be so largely in favour as a commercial adjunct to the tenant-farmers' holding, must possess the all-important quality of utility in a great degree, and there can be no doubt but that it is this quality which has conduced to the survival of the Large Black pig, and to its present prominence as the animal best suited to the needs of the modern breeder, feeder, bacon-curer, and consumer. Five-and-twenty years ago Large Blacks were fed to enormous and, indeed, almost incredible weights, but, being in the hands of men who had to study the market and supply a carcase which would meet the requirements of the times, the great weight has given way to greater quality, and the Large Black now yields at a very early age the chief desideratum, viz., a long, deep-sided carcase of 160lb. to 190lb. dead weight, light in shoulder, jowl, and offal, and showing a larger proportion of lean meat than any other breed. The pre-eminence of the breed in this respect was strikingly illustrated in the results of the carcase competition for swine held in connection with the Christmas show of the Suffolk Fat Cattle Club in 1899. Two classes, open to all breeds and crosses, were provided, the one being for 'Bacon pigs, live weight 190lb. to 220lb.,' and the other for 'Bacon pigs, live weight exceeding 220lb. and not exceeding 280lb.' Large Blacks were awarded first and second prizes in the first-named class, and first prize and reserve number in the class for heavier weights! Large Blacks are exceedingly docile in disposition, and the natural carriage of the ears, well forward over the eyes, is said to contribute materially to a quietness of habit which renders them peculiarly adapted to field grazing. Their colour also is claimed to be an advantage, as it enables them to be pastured or field fed during the summer months without suffering from sun scald. The excellent character which the breed bears for fecundity is visibly supported by the capacity with which the sows are endowed in respect to length and depth of carcase.

"The Large Black Pig Society was suggested early in 1898, and at a meeting of breeders held upon the Royal Show ground, at Birmingham, in June, 1898, it was resolved that it was advisable to form a society to advance the interests of breeders, and to establish a Herd Book, a committee being appointed to carry out the preliminary work. At a meeting held at the Smithfield Club Show, in December of the same year, the name of the society was adopted, scale of points, articles of association, by-laws, etc., were formulated, and it was decided to incorporate the society under the Companies Acts. This was duly effected, the certificate of incorporation being dated April 18, 1899.

"Immediately following the announcement of the intention to form the society, a widespread demand for Large Blacks was experienced, and all known breeders—especially those who availed themselves of the advantages offered by the advertisement columns of the agricultural Press—have enjoyed a remunerative trade during the last 12 months. In addition to the inquiry for the United Kingdom, a number of Large Blacks have been exported to South Australia and Germany.

Raising Stock.

Having decided the breed, it would be as well to bear in mind that it will be found more profitable to so arrange matters that the animals will not all be in their prime at the one time, but rather follow on from time to time as the demand for them requires. This is also necessary in order to get the best possible returns from the crops and pastures.

It is estimated that on the start of the two factories at least a thousand pigs will be required, increasing to two thousand thereafter.

Feeding.

A mistake is often made in allowing pigs to consume any kind of fodder that there may be lying about, thus getting the animals comparatively fat and then allowing them to go back again. A farmer once, on being remonstrated with for what appeared careless feeding—starving one day and over-feeding the next—said that he did it on purpose "because he liked streaky bacon."

Pigs can be brought up on stubble and good pasture lands and afterwards topped off with wheat. When this is done systematically and carefully, raisers can obtain quite a handsome profit in feeding and fattening for the market.

Animals should be taken off root crops when poor and topped up at once. To leave them for any length of time without a good topping of wheat means degeneration.

They should be fed regularly and often, giving just as much as they will clean up without leaving it.

The actual quantity of feed required to bring a pig up to a certain size depends to a great extent on the class of food available. Experiments have been made time out of number in order to fix what might be termed a standard feed.

Corn, wheat, and grains should not be either cooked or steamed; the best results always follow when given uncooked. Neither do pigs require the grain ground up, except in the later stages of the fattening period. In some cases an apparent loss has been noticed in feeding on too much ground meal. As a result of experiments it was found that it took 4·45lbs. of mixed grains, such as peas, corn, wheat, maize, barley, and rye, to produce 1lb. gain in weight, and 4·36lbs. to obtain a similar result when those grains were ground up. In still later experiments it was found that it took 4·08lbs. of whole grain and 3·56lbs. of ground grain to make 1lb. of gain in the pig. It is therefore fair to surmise that the gain on the slight difference in the bulk required is lost in the cost of grinding.

The feeding of young pigs for bacon purposes is far more profitable than feeding advanced stock. This is shown in a very clear manner by the following table, based on Professor Henry's table in "Feeds and Feeding" and published in the *Farmers' Cyclopædia.*

Relation between Weight of Pigs, Gains made, and Food required.

Weight of pigs.	Average weight.	Number of trials.	Number of animals fed.	Average feed eaten per day.	Feed eaten daily per 100lbs. live weight.	Average gain per day.	Feed required to make 100lbs. gain.
lbs.	lbs.			lbs.	lbs.	lbs.	lbs.
15- 50	39	45	190	2·41	5·82	·78	305
50-100	79	112	508	3·62	4·58	·94	402
100-150	123	133	635	5·03	3·96	1·20	439
150-200	178	110	509	5·98	3·44	1·26	479
200-250	227	76	316	6·60	2·96	1·35	493
250-300	269	51	247	7·34	2·71	1·48	509
300-350	322	21	115	7·54	2·39	1·47	532

The above figures are based on so many experiments and animals that they may be considered reliable, and could be used as a basis in order to calculate the profits of pig raising in so far as feeding stuffs are concerned.

The last column of this table shows most distinctly that it requires about two-thirds more food to produce 100 pounds of gain with hogs weighing 300lbs. than with those weighing only 30 to 40lbs.; and it is noticeable that there is a uniform increase in the amount of food required to produce a pound of gain as the pigs increase in weight.

What Feed to Grow.

Figs make an excellent balanced ration for pigs. This crop lasts so long, and is available in the season when other feed is wanting that it must recommend itself; besides, the saccharine matter is so plentiful in this fruit that it's fattening qualities should be highly appreciated.

Rape, barley, and wheat should be grown, while corn is the cheapest and most satisfactory grain to use as a stock feed. Roots of all kinds are good, and there is no better crop than that of sweet potatoes. Of course different foods give different results. The quantity of grain required to gain 100 pound weight in the pig is as follows:—Barley, 418lbs.; corn, 485lbs.; oats, 472lbs.; peas, 439lbs.; wheat, 452lbs.; mixed grains, 432lbs.

Feeding Pigs through the Dam.

Professor Henry states that:—"The question whether a pound of food goes farther when fed directly to young pigs or when first fed to the dam is an interesting one to the stockman. The writer has conducted trials with eight litters of pigs, noting feed and gains, for information on this subject. In all cases the dams and pigs were weighed separately each week, and record kept of the food eaten by each sow and her litter before weaning, and of the pigs after weaning. The pigs were taught to eat at an early date, and encouraged to do so by placing food in a trough where it was accessible to them but not to the dam. The feed consisted of corn meal, middlings, oats, barley, and skim milk. At ten weeks the pigs were weaned, the feeding continuing for seven weeks. We were thus enabled to measure the feed required for gain by the sow and pigs before weaning, and by the same pigs after weaning. In all cases the loss in weight by the sow while suckling her young is taken into account, the results reported being the net gains after deducting such loss.

Feed required for 100 pounds of gain with sow and pigs before weaning, and by the same pigs after weaning—Wisconsin Station.

	Sows and Pigs before Weaning.		Pigs after Weaning.	
	Meal.	Milk.	Meal.	Milk.
	lbs.	lbs.	lbs.	lbs.
Lot I.	241	563	251	587
Lot II.	288	649	215	577
Lot III.	198	654	213	449
Lot IV.	240	528	177	542
Lot V.	184	482	187	562
Lot VI.	254	509	251	502
Lot VII.	235	474	259	518
Lot VIII.	208	416	286	571
Average	231	534	230	539

It will be seen that the sow and pigs together before weaning, and the pigs alone after weaning, required almost identical quantities of milk and meal for the production of 100 pounds net gain. At first thought it appears impossible that as good gains can be secured with young pigs from a given amount of feed administered through the sow as can be obtained by direct feeding. A possible explanation lies in the fact that the body of the very young pig contains a large proportion of water, so that less dry matter is required for a pound of gain than with older animals. Again, each pound of flesh lost by the dam during this time may have yielded more than a pound of increase with her young."

The rearing of pigs through all its stages would take up more space than intended for this article, but this matter will be dealt with *in extenso* in a future issue, as will also the subject of styes, etc.

In conclusion, it must be borne in mind that at present the imports of pig products (bacon, hams, etc.) amount to £130,000 per annum. Even when the present demand has been supplied, we have markets in India, Ceylon, Singapore, and South Africa that will take almost an unlimited quantity. As this State is nearer these markets than any of the other States of the Commonwealth, pig raising for bacon should be a most profitable industry for farmers in Western Australia.

EXPERIMENTAL FARM, HAMEL.

By G. Berthoud.

Hops.

The plot devoted to this crop was planted 18 months ago with imported sets of the "Oregan" variety. The plants are now fairly strong, clean, and free from insect pests, etc.

The vines have made vigorous growth, covering two tall poles per hill. These yielded a fair crop of catkins, which ripened rather unevenly. Some were discoloured and damaged by the high eastern winds which prevail here during the summer months.

The hops picked during the week are of good quality, being rich in lupulin and of pleasant aroma. The yield is at the rate of 2,250lbs. green, which would give about 600lbs. of cured hops to the acre.

The green hops were placed in shallow wood and hessian trays and sun-dried. When pressed I shall forward samples to the Department for testing.

It is very doubtful if this crop will pay to cultivate here, owing to the high cost of labour for picking, etc.

"Broom Corn," variety "Weber's Imported Evergreen."

A small plot of this was sown in October. The plants have grown tall and made very healthy growth. Part of the bushes matured, and were cut during the week. They are of good colour, and ranged to 20in. in length. I consider that this would be a payable side crop for farmers to grow on suitable land.

CHAPMAN EXPERIMENTAL FARM.

REPORT FOR FEBRUARY.

By R. C. Baird.

During the month threshing operations were carried on and completed. The weather was most favourable for the work, only one day being lost through strong winds.

Harvesting operations were commenced on 16th October with silage-making, the crops used being partly barley and partly oats, self-sown, which were cut with the binder and stacked. About 20 tons of silage were made.

Hay-cutting was commenced on 21st October. Sullivan's Early Prolific and Majestic were the varieties of wheat cut, yielding about 1½ tons per acre from 40 acres. Twelve acres of Algerian oats were also cut for hay, yielding about 1 ton per acre.

Thirteen varieties of wheat were grown for grain in various-sized areas. The seed and fertiliser drill was used, placing the grain in drills about 7in. apart and 2in. deep. The manure was applied at the time of drilling.

The grain crop was harvested during the month of November. The reaper and binder was used to cut the crop, and the threshing was done with one of Gray & Sons' treadmill threshers.

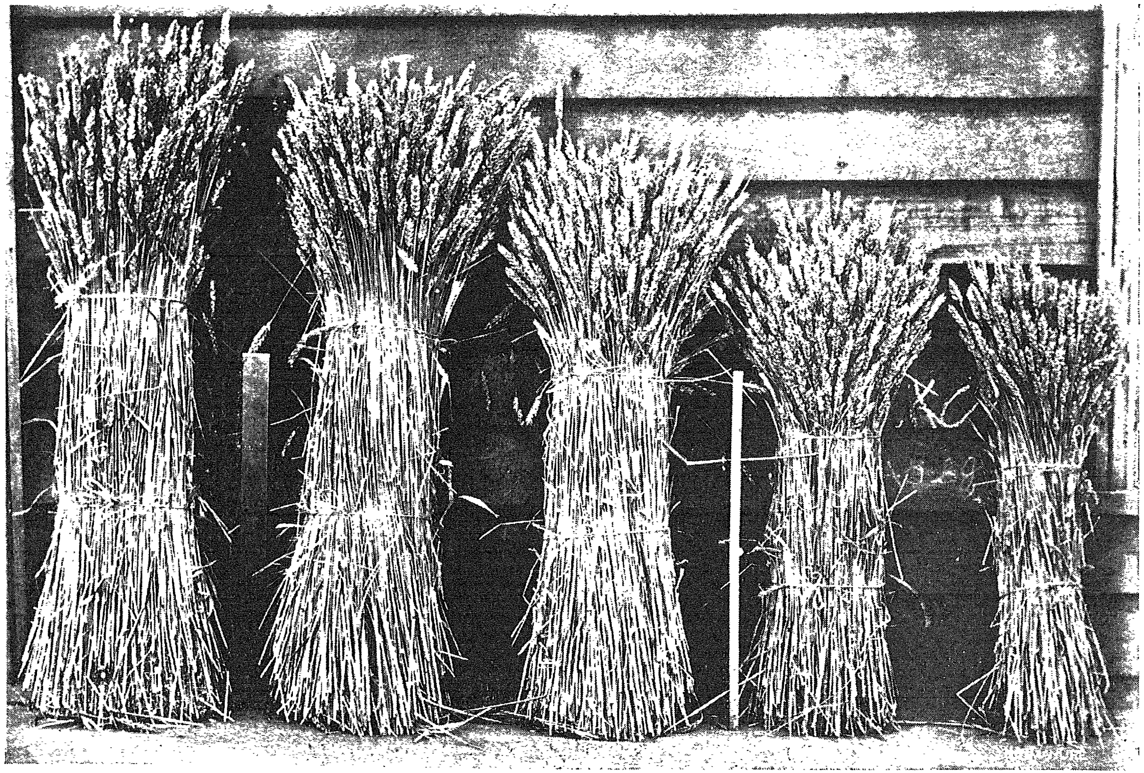
Results of Field Crops.

Variety.	Date Sown.	Manures. Rate per acre.	Character of Soil.	Yield per acre.	Remarks.
WHEAT.				bushels.	
Australian Cross-bred 77	May 19	Super., 100lbs. ...	Red loam ; 2nd crop ...	16¾	Early, straw weak, thin grain
Jade ...	June 1	,, ,, ...	,, ,,	21	Medium early, strong straw, plump grain
Jade ...	,, 29	Thomas' Phos., 100lbs.	Poor sandy soil ; 1st crop	14¼	,, ,, ,,
Toby's Luck	,, 26	Super., 100lbs. ...	Fair red loam ; 1st crop	22	Strong straw, plump grain
Lucky Talavera	,, 26	,, ,, ...	,, ,,	16	Medium early, good grain
Australian Cross-bred 73	,, 26	,, ,, ...	,, ,,	19½	Early, good grain
Alpha ...	,, 26	,, ,, ...	,, ,,	14¼	Early, plump grain
Australian Cross-bred 100	,, 26	,, ,, ...	,, ,,	14¼	Early, grows tall
Plover ...	,, 26	,, ,, ...	Poor sandy soil ; 1st crop	7	Mid early, thin
White Lammas	,, 26	,, ,, ...	Rather poor soil ; 1st crop	15¼	Mid early, plump grain
Tardent's Blue	,, 26	,, ,, ...	Poor sandy soil ; 1st crop	15	Late, good grain
Gallard's Hybrid	,, 26	,, ,, ...	,, ,,	4	Not suitable for this district
OATS.					
Algerian ...	,, 12	Super., 100lbs. ...	Fair loam ; 3rd crop ...	28	Early, fairly plump
Golden Fleece	July 1	Thomas Phos. ...	Good loam ; 3rd crop ...	19	Fairly plump
White Siberian	,, 12	,, ,, ...	,, ,,	13	Thin and light
BARLEY.					
Cape Barley	June 30	Super., 100lbs. ...	Good red loam ; 2nd crop	36	Fair grain, rather smutty

Results of Cropping on the Sand-plain.

Variety.	Date of Sowing.	Manures. Rate per acre.	Character of soil.	Yield per acre.	Remarks.
WHEAT.				bushels.	
Alpha ...	July 18	Guano, 120lbs. ...	Sand Plain	7⅓	Fairly plump ; good colour
Rerraf ...	,, 19	,, ,, ...	,, ,, ...	4	Grain small and shotty
Australian Cross-bred 73	,, 19	,, ,, ...	,, ,, ...	6½	Good, bright colour
Steinlee ...	,, 19	,, ,, ...	,, ,, ...	5	Grain rather thin

Owing to the lateness of seeding the above yields are very low. I feel sure had these wheats been put in six weeks earlier and superphosphate used, the results would have been very much better.



Results of Manure Tests on Wheat grown at the Chapman Experimental Farm.

Manure Test-plots carried out on Sand-plain.

No. of Plot.	Date of Sowing.	Manures. Rate per plot.	Cost of Manure per plot.	Yield per acre.	Remarks.
			s. d.	bushels.	
No. 1 ...	July 19	Thomas' Phos., 66lbs.	2 6	$8\frac{1}{4}$	Straw fair length; grain good
No. 2 ...	,, 19	Super., 48lbs.	2 2	$8\frac{1}{4}$	,, ,, ,,
No. 3 ...	,, 19	Victorian Super., 40lbs.	2 6	8	Fair heads, medium straw, good grain
No. 4 ...	,, 19	Guano, 116lbs.	2 11	$5\frac{1}{4}$	Light straw, very small heads
No. 5 ...	,, 19	No manure	...	1	Exceedingly poor

The area of above plots was 1 rood 28 perches each, and the variety of wheat sown was Australian Crossbred 73.

THE INSECT PESTS AMENDMENT ACT, 1898.

Amended Regulations.

ORDER IN COUNCIL.

At the Executive Council Chamber, at Perth, this Eighth day of February, 1906.

Present:

His Excellency the Governor.

The Honourables—

The Colonial Treasurer,	The Minister for Commerce,
The Colonial Secretary,	M. L. Moss, M.L.C.

Whereas by "The Insect Pests Amendment Act, 1898," the Governor, by Order in Council gazetted, may from time to time make such Regulations as he deems necessary for the purposes mentioned in Section 24 of the said Act: And whereas I, Admiral Sir Frederick George Denham Bedford, G.C.B., Governor, etc., etc., etc., deem it necessary that all Regulations heretofore made under this Act should be revoked and other Regulations made in lieu thereof for the purposes of the said Act: Now therefore I, the said Governor, by and with the advice and consent of the Executive Council, do hereby order and proclaim that the Regulations made on the 23rd day of July, 1902, under an Order in Council gazetted on the 1st August, 1902, and all other Regulations made under the said Act, be revoked, and I do hereby, in lieu thereof, make the following Regulations for the purposes of the said Act.

F. G. W. HICKLING,
Acting Clerk of the Council.

REGULATIONS.

Importation and disinfection of vine cuttings, buds, and grapes.

1. The importation of rooted grape vines, or grape vines that have had their roots removed, is absolutely prohibited.

2. All vine cuttings imported shall be absolutely surrendered to the Chief Inspector or Local Inspector, at the port of debarkation, for the purpose of being quarantined, as hereinafter provided.

3. All vine cuttings imported shall be quarantined by the Department of Agriculture for a period of not less than 12 months nor longer than two years upon such grounds as from time to time shall be set apart by the said Department, by advertising in the *Government Gazette*, as quarantine stations. The consignee, agent, or other person engaged or concerned in the importation of any such vine cuttings as aforesaid shall, at the time of delivering the same to the Department of Agriculture for the purpose of being quarantined, pay to the Director of Agriculture a sum of 2s. 6d. for every 100 cuttings so delivered, and at the expiration of the period of quarantine shall, upon taking delivery of his rooted vines, pay the further sum of 2s. 6d. for every 100 rooted vines so delivered to him.

4. Any vine cuttings imported which are, at the time of landing, in the opinion of the Chief Inspector or Local Inspector affected with insects, fungi, blight, or other diseases injurious to grape vines or other trees or plants, shall be destroyed under the direction of the said Inspector, and the expense connected therewith shall be borne by and recoverable from the importer of such vine cuttings.

5. The Department of Agriculture shall not be liable for any loss resulting from the destruction of any cuttings under the provisions of the preceding paragraphs, or by reason of the infertility of any such cuttings while in or after leaving its custody or whilst under its control.

SCHEDULE.

Scale of fees to be paid for the inspection and disinfection of vine cuttings and buds.

	s.	d.
100 or less	2	6
Over 100 and not more than 500	5	0
Over 500 and not more than 1,000	10	0
Over 1,000, for every additional 1,000 or part thereof	2	6

Disinfection of imported trees, plants, cuttings (other than vines), grafts, buds, seeds, pits, scions, and fruits.

6. All fruit, fruit trees, plants, cuttings, grafts, buds, seeds, pits, or scions imported into the State of Western Australia shall be discharged direct from ship or lighter into trucks, or as may be ordered by the Director of Agriculture, for immediate removal to the disinfecting sheds, and shall not be discharged upon any wharf, quay, jetty, or premises unless so ordered by the Director of Agriculture.

7. All consignees, agents, or other persons engaged or concerned in the importation into Western Australia of any fruit, fruit trees, plants, cuttings, buds (other than vine cuttings or buds), seeds, pits, or scions shall, within twenty-four (24) hours after the arrival of any such fruit, fruit trees, plants, cuttings, buds, seeds, pits, or scions at the first port or place of

debarkation in the State of Western Australia, deliver the same to the said Chief Inspector or Local Inspector, and unpack and prepare them for disinfection, and in the event of any such consignee or his agent failing to so deliver any such fruit, fruit trees, plants, cuttings, buds, seeds, pits, or scions within twenty-four (24) hours as aforesaid, the Chief Inspector or Local Inspector shall seize the same. If upon such seizure the said fruit, fruit trees, plants, cuttings, buds, seeds, pits, or scions are found to be infested with any injurious insects (or their germs), or with fungi, blight, or other diseases injurious to fruit or to vines or fruit trees or to other trees or plants, the said Inspector shall immediately destroy the same; but if the said fruit, fruit trees, plants, cuttings, beds, seeds, pits, or scions are found on inspection to be free from injurious insects (or their germs), or from fungi, blight, or other diseases injurious to fruit, fruit trees, vines, or other trees or plants, the said inspector shall treat the said fruit, fruit trees, plants, cuttings, buds, seeds, pits, or scions as may be prescribed by the Director of Agriculture, and hold same until applied for by the consignee or agent: provided that if the same be not applied for within 48 hours from the time of seizure same may be destroyed.

8. No passenger, agent, or other person shall introduce into Western Australia at any port or place, or be concerned in the introduction of any fruit, fruit trees, plants, scions, cuttings, or bulbs with the personal effects of such passenger, or in any package or parcel, or otherwise howsoever, except under the direction and with the approval of an Inspector or other authorised person under "The Insect Pests Amendment Act, 1898." This regulation does not apply to the introduction of fruit, fruit trees, plants, etc., as cargo.

9. All fruit, fruit trees, plants, cuttings, grafts, buds, seeds, pits, or scions imported into the State of Western Australia are hereby required to be disinfected by the Chief Inspector or Local Inspector immediately upon arrival at the port or place where they are to be unloaded. If any of the said fruit, fruit trees, plants, cuttings, grafts, buds, seeds, pits, or scions are found to be infested with insects (or their germs), or with fungi, blight, or other diseases injurious to fruit, or to fruit trees or to other trees or plants, they shall remain in quarantine for a period of fourteen (14) days, or until the Chief Inspector or Local Inspector can determine whether the said trees, plants, cuttings, grafts, buds, seeds, pits, or scions are free from injurious insect pests or their eggs, larvæ, or pupæ. After inspection and disinfection, the Chief Inspector or Local Inspector shall issue a certificate after the cases or packing or transportable material in which such fruit was packed has been disinfected as prescribed by Order II. and on receipt of the fee for inspection and disinfection prescribed in Schedules I., II., and III. hereto. After disinfection, consignees or their agents must repack the fruit, fruit trees, vine cuttings, packages, or transportable material that have been disinfected, and remove the same within twenty-four (24) hours.

10. All peach, nectarine, apricot, plum, prune, almond, and all trees budded or grafted upon peach stocks or roots, and all peach or other pits, cuttings, buds, or scions raised or grown in any place where the "peach yellow" or the "peach rosette" are known to exist, are here prohibited from being imported into the State of Western Australia.

11. The importation into any port in Western Australia of any fruit plant or part thereof infested with the codlin moth, mussel scale, Queensland

fruit fly, phoma citricarpa, aspidiotus nerii, phylloxera, San José or pernicious scale, the mining or chionaspis scale, the wax scale, or with internal parasites such as the larvæ of the codlin moth, fruit flies, nematodes or bacterial diseases, with melanose fungus, or with any pests, parasites, or fungi which may from time to time be declared as such by the Governor in Council under Section three of "The Insect Pests Amendment Act, 1898," is absolutely prohibited.

12. All consignments of fruit, or portions of consignments, consisting of one or more varieties of fruit of which 15 per cent. of the cases in the consignment or of the said portion thereof are found to contain fruit infected by codlin moth or fruit fly, shall be destroyed.

13. The importation into any port in Western Australia of any pear trees, stocks, or cuttings from the United States of America is absolutely prohibited.

14. Soil or compost in pots, cases, or packages, and transportable material of any kind used for packing or surrounding fruit, is hereby prohibited from being removed from the first port or place of debarkation, or from being offered for sale, gift, distribution, or transportation until the said material (unless otherwise directed by the Director of Agriculture) has been disinfected by dipping the same and keeping it continually submerged for a period of not less than five (5) minutes in boiling water containing in solution not less than one pound (1lb.) of concentrated potash to each and every ten (10) gallons of water.

15. Fruit cases containing vegetables or vegetable matter other than fruit imported into the State are also hereby required to be disinfected, as per Order II., before removal from the first port or place of debarkation.

16. Any fruit, fruit trees, vine cuttings, packages, or transportable material delivered to the Chief Inspector or Local Inspector for disinfection, and not disinfected within forty-eight (48) hours by reason of the default of the consignee to provide the necessary labour for unpacking and repacking, may be destroyed by the Chief Inspector or Local Inspector.

Schedule I.

Scale of fees to be charged for inspection of fruit.

	s.	d.
56lbs. or under	2	6
Over 56lbs. and not more that 112lbs.	5	0
Over 112lbs. and not more than 224lbs.	7	6
Over 224lbs. and not more than 336lbs.	10	0
Over 336lbs., for every additional 112lbs. or part thereof	1	0

Schedule II.

Scale of fees to be paid for the inspection of trees, plants, etc., of all descriptions other than vine cuttings.

	s.	d.
25 or less	1	6
Over 25 and not more than 50	2	6
Over 50 and not more than 100	4	6
Over 100 and not more than 200	6	6
Over 200 and not more than 300	7	9
Over 300 and not more than 400	9	0
Over 400 and not more than 500	10	0
Over 500, for every additional 100 or part thereof	0	9

SCHEDULE III.

Scale of fees to be charged for the inspection and disenfection of gooseberries, raspberries, and other small plants of like nature, at the discretion of the Director of Agriculture.

	s.	d.
25 or less	0	9
Over 25 and not more than 50	1	3
Over 50 and not more than 100	2	3
Over 100 and not more than 200	3	3
Over 200 and not more than 300	4	0
Over 300 and not more than 400	4	6
Over 400 and not more than 500	5	0
Over 500, for every additional 100 or part thereof	0	6

SCHEDULE IV.

For cuttings of plants and trees, small seedlings not in pots, strawberry plants, and bulbs:—

	s.	d.
Every 1,000 or part thereof	1	0

REGISTRATION OF ORCHARDS, VINEYARDS, AND NURSERIES.

17. The owner or occupier or person in charge of any orchard, garden, nursery, vinery, vineyard, or hothouse, or any land used for the purpose of growing or cultivating any plants, shall register the same with the Director of Agriculture, at Perth, in the form of the accompanying schedule.

SCHEDULE.

Insect Pests Amendment Act, 1898.

Magisterial District........................Collector's District ....
(by Collector's District is meant the Police Patrol District).
Names of Owner and Occupier and person in charge.......................
Name of holding for which this return is supplied.......................
Postal address.......................

I hereby certify that, to the best of my belief and knowledge, the above particulars are correct.

Signed.......................

18. All packages sent away from any nursery containing fruit trees, vines, or other vegetation intended for sale, distribution, or gift must be legibly marked with the name and address of the consignor and consignee, and a descriptive invoice of the contents must accompany same, with certificate to the effect that such contents have been disinfected as may be prescribed from time to time by the Director of Agriculture, and are free from insects, fungi, blight, and all other diseases attacking fruit trees and other vegetation.

19. Any vendor of fruit, grower, dealer, or auctioneer who shall sell or attempt to sell or offer or expose for sale any fruit, fruit trees, plants, or other vegetation affected with the codlin moth, mussel scale, Queensland fruit fly, phoma citricarpa, phylloxera, San José or pernicious scale, the mining or chionaspis scale, the wax scale, or with internal parasites such as the larvæ of the codlin moth, fruit fly, or nematodes or bacterial diseases or melanose fungus, or with any other diseases which may from time to time be declared as such by the Governor in Council, shall be liable, on conviction, to a penalty not exceeding one hundred pounds (£100), and any inspector or other authorised person shall seize and destroy such infected fruit, and

the cost of such seizure and destruction shall be at the expense of and recoverable from the person selling or offering the said fruit for sale, gift, or distribution.

20. No compensation will be paid for any fruit, fruit trees, plants, cuttings, buds, seeds, pits, scions, cases, packages, or transportable material destroyed under these Regulations.

21. The use within the State of second-hand fruit cases, or cases or packages that may reasonably be supposed to have contained fruit, is prohibited, and the Chief Inspector or Local Inspector may order the disinfection of same as provided in Order II., or by any other means that may be prescribed by the Director of Agriculture, and failing such disinfection shall seize and destroy same.

22. The foregoing orders do not apply to any port or part of the State of Western Australia North of the 26th parallel of South Latitude.

23. The importation into the State of Western Australia South of the 26th parallel of South latitude of fruit, fruit trees, plants, cuttings, grafts, buds, seeds, pits, or scions is prohibited except through the ports of Albany and Fremantle.

24. These Regulations shall come into force on the 16th day of February, 1906, and supersede those gazetted on the twenty-third day of July, 1902.

FOALING.

By R. E. Weir, M.R.C.V S., C.G.S.

In addition to the false presentations already enumerated, it is possible for a mare to have twins, and both be presented together. An occurrence of this nature may be recognised from the unusual appearance of a hind and fore leg, the positions of which will indicate that they do not belong to the same animal. Having arrived at this conclusion, the difficulty may easily be adjusted by securing the leg which appears to be in the more forward position, and returning the other well back into the womb. Once placed in a natural position the delivery of both will be made comparatively easy. Instances have occurred where a mare has given birth to a foal, and another is retained in the womb. Where a contingency of this nature arises the placental membrane (or after-birth) is also retained, and the health of the animal becomes consequently impaired. When such symptoms are notice-

able an examination should be made, and the womb explored. In the event of a fœtus being present it will, without a doubt, be lifeless, and immediate steps require to be taken for its removal. Afterwards the womb should be thoroughly cleansed and disinfected. As the result of an accident, over exertion, or other causes, it is possible for the dead fœtus to be carried in the womb for some considerable time. Premature pains will be noticeable in such instances at regular intervals until about the natural time of foaling, when an examination needs to be made and the true condition ascertained. It is possible that some difficulty will be experienced in removing the fœtus under these circumstances, and one thoroughly acquainted with the work will, of necessity, have to be procured. I have personally seen cases where such great difficulty is experienced in the removal of the dead fœtus that the severe pains attached to the operation have resulted in the expulsion of the womb after the foal was removed. However, with careful washing and disinfecting it was returned to the natural position, and no injury resulted to the part, and the mare progressed favourably and made a complete recovery after a term of ordinary nursing.

Rupture of the vagina and other complications of a like serious character are not uncommonly associated with difficult paturition, and although surgical and other treatment may be applied, yet the more serious cases are usually of a fatal nature.

POULTRY NOTES.

By Frank H. Robertson.

SOME DISEASES OF FOWLS.

Poultry are liable to be attacked by a great variety of complaints, several of which have already been described in the Pamphlet issued by this Department. This month is given a description of ailments not already enumerated.

Puffed Skin.

Occasionally a few chickens will be found which seem to have little air bladders between the flesh and the outer skin, puffing out the sides to a remarkable degree. No serious results are likely to ensue from this complaint, which is simply got rid of by puncturing the inflation by running a needle right through from one side to the other. The air will probably accumulate again, in which case repeat the puncture. If the fowl is out of sorts, add a little iron tonic to drinking water and feed very lightly.

Gaping.

Spasmodic gasping, or gaping, is caused by two different complaints, viz., by what is known as Gapes, due to the presence of a parasite in the trachea, or windpipe, or it may be due to an affection of the bronchial tubes or lungs, each requiring entirely different treatment. The first-named complaint is, fortunately, very rare in Australia, and to make certain of its presence, an examination of a dead fowl will speedily settle the question, as the worms are easily noticeable attached to the interior of the windpipe; or if a live fowl is experimented on, a feather stripped, all except a tuft at the end, should be inserted into the trachea and twisted to dislodge the pests, or a double horsehair can be used; and to kill the gape worms in the trachea, first dip the feather in salt and water, or let bird inhale carbolic fumes or lime dust.

Birds also gape when the air-passages are invaded with a fungus growth which has attacked fowls which have access to musty straw or grain.

Gaping to a lesser degree, or, more strictly speaking, a difficulty in breathing accompanied by wheezing, can be called typical bronchitis. For treatment, keep in a warm place, steam with hot water, medicated with a few drops of eucalyptus oil; linseed water has a good effect; if the attack is severe, give six drops of ipecacuanha wine.

A dry cough at occasional intervals, but more noticeable at night-time when bird on roost; if the bird is otherwise in good health, can generally be cured by cooping bird up and adding to drinking water tincture of aconite, six drops to half pint.

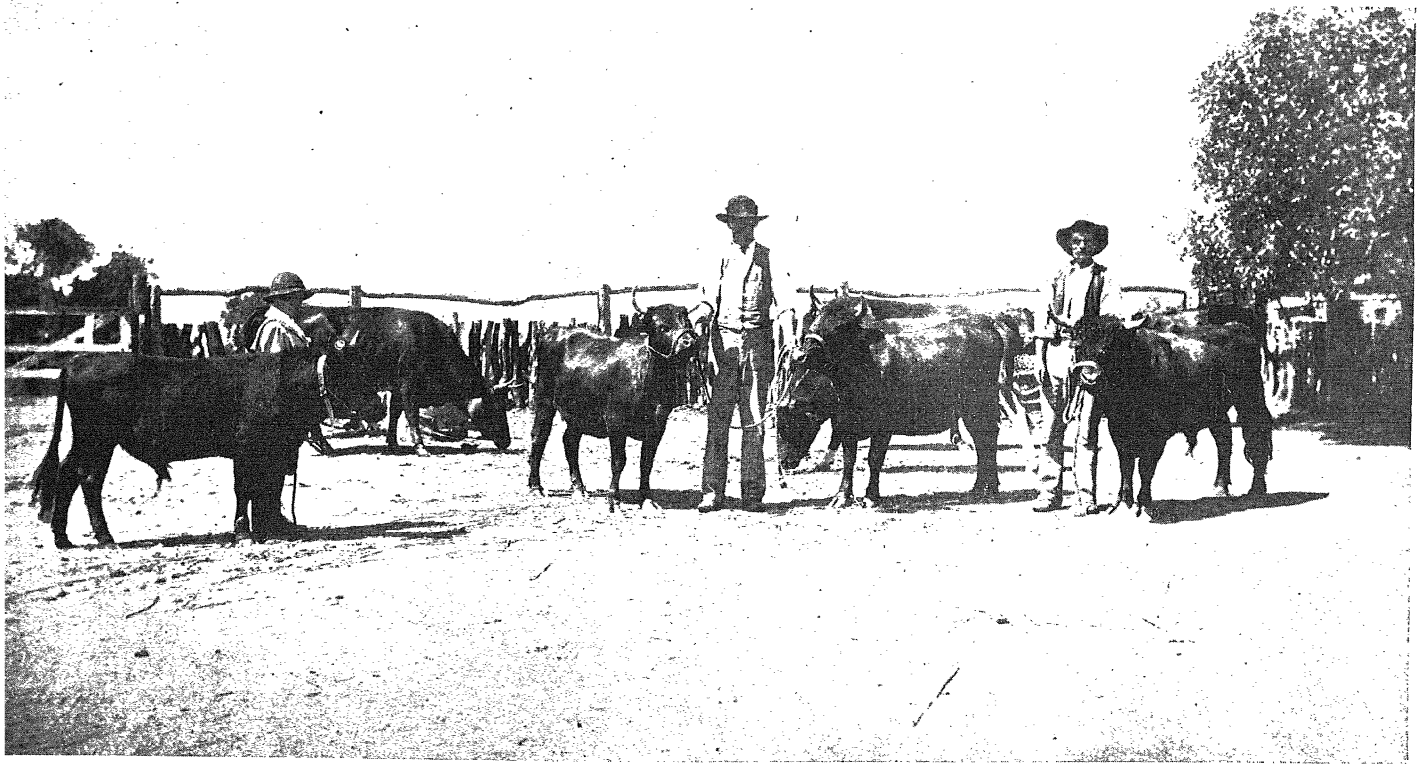
Broken Beak.

Not unfrequently, from some cause or other, a fowl will get one of its mandibles broken. If such a bird is allowed to run about and rely on picking up its food as usual, it will have great difficulty in doing so, and its general health much injured through inability to obtain sufficient sustenance owing to the great pain caused by the broken beak coming in contact with the hard ground. The course to take is to pen the bird up, feed on soft food only, giving a large supply, placed in a fairly deep vessel. What remains after each feed should be removed. As the beak mends, grain can be supplied in a similar manner.

Down Behind.

This is occasionally to be found in old hens; the abdomen presents a baggy appearance almost touching the ground, and is owing to cysts and tumours of various kinds, attempts to cure some cannot be considered effective.

There is, however, another form of broken down, which may be cured with time and patience; that is when there is no appearance of internal growth, but the bird appears to have an affection in the muscles of the back, and struts or waddles along with difficulty, abdomen touching the ground, and head erect, giving the bird a peculiar penguin appearance. Mr. Cobb describes a simple and ingenious cure, viz., to coop bird in a well ventilated box, but with roof so low that the bird cannot stand upright, leave it there on a comfortable nest and give Epsom salts, and feed lightly, removing the bird for a few minutes each day until cured.



Dexter Cattle at the Chapman Experimental Farm.

Fowl Throwing Head Back.

With fowls that are over-fed and have but little exercise, some of them are liable to suffer from congestion of the brain, causing birds to stagger about in a peculiar backward manner, head well back or twisted to one side. Keep birds in a quiet place and apply ice to the head; if such is not available, hold head under a running stream of water for a considerable time; failing the above treatment bleed bird well by making an incision on the comb. Feed bird very sparingly on light unstimulating soft food, and give Epsom salts.

Warts.

Warts on the face, comb, ear-lobes, and wattles can be cured by the application of crude phenyle, but as this disease, commonly known as chicken pox, so often occurs too close to the eyes to allow of the application of such a severe remedy. Holloway's ointment, if well smeared over each nodule, and then rub in powdered sulphur, one application will generally suffice to kill the fungus or parasite which causes the complaint; the scabs drop off in about a week's time after being treated.

Protrusion at Vent.

This complaint, known as prolapris, is generally owing to excessive straining in efforts to expel an egg, more particularly with old and fat hens. The eversion may be only of the cloaca and present a red and inflamed protrusion, in which case wash the affected part with warm water, smear with carbolised vaseline and press the part back gently. Keep the bowels open by a dose of Epsom salts, and give 3 to 5 drops of fluid extract of Ergot. Feed only on light soft food such as boiled rice and lettuce.

If egg-bound treat accordingly.

In severe cases the protrusion trails on the ground, in which case Cobb recommends an ingenious form of treatment, viz., first wash the parts with an infusion of strong warm tea, place back the part, tie the fowls legs and place in a small but well ventilated hamper, well padded with straw all round, so that the bird cannot shift her position. Leave alone for twelve hours; then untie legs and give small feed of bread and milk, and replace bird as before. If protrusion again occurs, repeat operation.

Discharge from Vent.

This complaint, termed cloacitis, is a discharge at first offensive, causing much inflammation and irritation, which is made worse by being picked at by the fowl, thus causing sores.

Bathe affected part well with warm water, or, better still, hold same in warm water, to which has been added a little bicarbonate of soda, to allay the inflammation.

Give small doses Balsam Copaiba. Inject into cloaca a mixture as follows: Water 6 ozs., glycerine 2 ozs., morphia sulphate 1 gr., boracic acid $1\frac{1}{2}$ dr., and insert wad saturated with same solution; should discharge be persistent inject 3 grains of tannic acid to an ounce of glycerine.

Feed only only on plain soft food.

Swollen Legs and Feet.

This is not to be confounded with bumble foot, which is a totally different complaint, as it occurs where fowls are provided with low perches, and run on soft, sandy soil; no corns, cuts, or bruises are apparent, merely a swelling of the leg, which feels hot and inflamed, and the bird is quite lame and in pain. Hold leg in water as hot as the bird can bear until water cools, then rub in eucalyptus oil, and give daily small dose of Epsom salts in drinking water.

A bad case in writer's own yard was cured by merely keeping bird in small pen on sandy soil, and causing bird to roost on a broad, well-rounded, iron perch.

Eggs without Shells.

The laying of soft-shell eggs is generally attributed to want of shell-forming material, such as crushed oyster-shell, old mortar, etc.; yet it is a well-known fact that the production of eggs without their final covering does occur in yards where the fowls have an abundant supply of shell-forming material. When such does occur, the trouble is owing to the hens being too loaded with internal fat, which prevents the uterus performing its usual operation of adding the final covering to the egg. Therefore, to reduce the internal fat, feed birds for a few weeks on half-rations, chiefly stout oats, and add Epsom salts to drinking water.

THE POULTRY INDUSTRY IN WESTERN AUSTRALIA.

A poultry-keeper writes to the Editor as follows:—

When we realise that the present "egg"-bill of this State has reached the enormous amount of £80,000 per annum, and upon an increasing ratio, it is surely time to seek the cause, and devise some means to overcome this drain upon the State's resources.

"Ignorance" (and its co-partner "Apathy") is the primary cause for the backward state of the industry in Western Australia. Thousands of eggs, chickens, and ducklings are lost annually through ignorance of the right principles for successful incubation, rearing, feeding, and housing, which alone is the cause of a most serious shortage of supply and loss; also many thousands of birds, although they are hatched successfully, never reach maturity or the market, for the same reason. This has a most serious effect, as the poultryman says that poultry-keeping will never pay, and goes out of the business, and naturally others are discouraged, and even if they attempt poultry-keeping it is in a haphazard, apathetic way that spells ruin from the start. Education and practical demonstration are the only remedies to overcome this non-progressive position. I would start at the bottom of the ladder, and educate the child at the State School not only upon poultry culture, but upon all rural subjects, and especially in the country schools it is more than necessary to fit the rising generation for the soil, and stay the exodus of the farmers' sons and daughters to the cities; create the interest for rural pursuits in the child, and there is little doubt at manhood the choice will be for the country life in preference to the grind of city life.

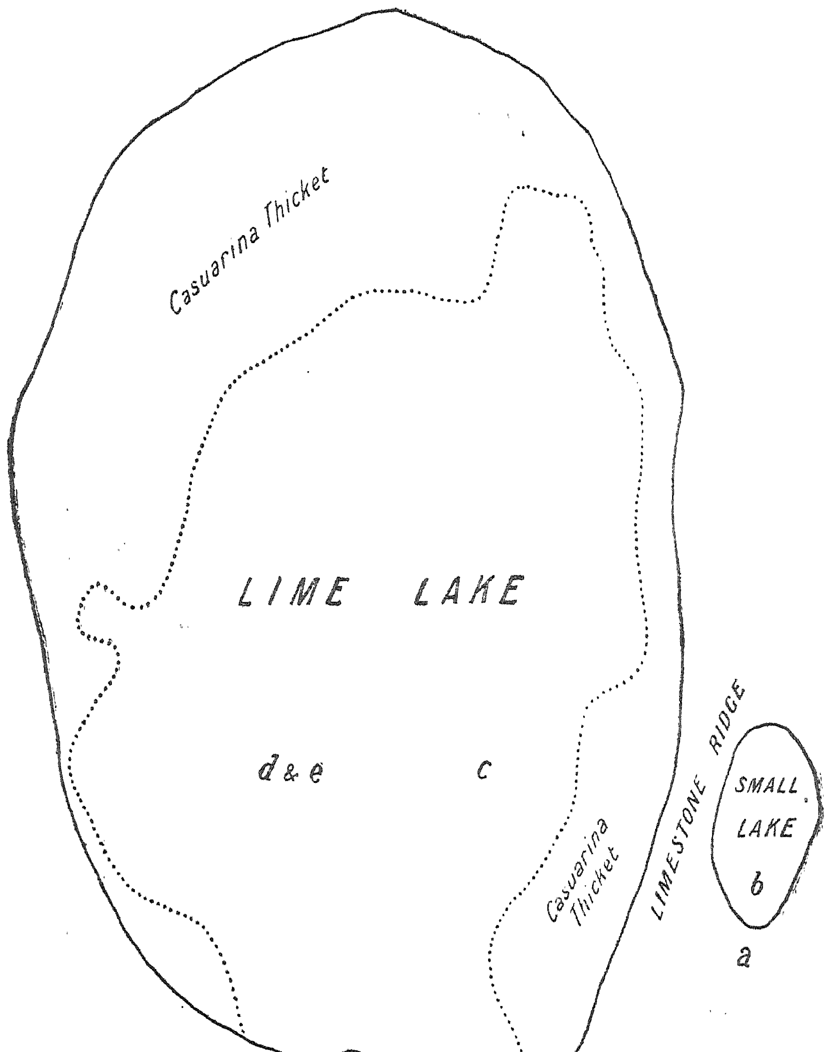
The Government Experimental Farm should be the next step, where the man, woman, or child going into the business could attend a course of lectures on practical subjects, and gain information from the actual work of the farm, and I would advise the granting of one scholarship each year for the benefit of the best scholar on poultry culture, and entitle him or her to a course of study upon the farm.

Lectures and poultry literature are a most useful means of education, but unfortunately only in a very few instances do you see the advice carried out, for one main reason: the average utility poultry man only looks at the immediate cash return he can get for the least work, and not being educated up to the stage to carry out any scientific experiment, however simple, himself, he listens to the lecture, reads his literature, and then drifts back to the old haphazard conditions.

Every poultry-keeper is working under a different system of his own creation, without any regard to right principles, for the simple reason that we have no practical educational system for him to follow; under those conditions is it possible for any industry to progress?

The poultry industry in the past decade has proved itself one of the most valuable of rural industries in other parts, and is growing into a vast commercial proposition, that employs some of the "brainiest" men and women to control it; but in this State, with *progress* for its watchword, that tired feeling that saps the life blood of any enterprise is the controlling power.

It is almost inconceivable that with the large and increasing demand existing here for poultry products—not an imaginary demand, but one proved by carefully compiled statistics—that so little has hitherto been done to foster and encourage this industry, while the fruit, dairying, and other industries have received so much attention. Ignorance of its true value, both as an asset to the State and a food of unquestionable necessity for the people, must be the cause. The poultry industry does not ask for or require any large outlay of public money or nursing, but it does require encouragement and assistance in its initial stages, with educational opportunities and practical demonstration to develop it upon right lines, and teach and equip those taking up the business. The present system of one expert to deal with the whole State is worse than useless, and asking too much from one man, however good, and it cannot result in any immediate good; also the subsidies granted to the different shows are of no use to increase the production of marketable birds or eggs. It is of little consequence as a commercial value that a bird should have certain markings in feather if it is wanting in flesh points and egg-production, and, unfortunately for the industry at large, our shows have not, and never will, under present conditions, encourage utility breeding or production, therefore I fail to see the necessity for the Government subsidising what is fast becoming a fad of *Feather* and *Comb*, without one point of utility.



-ROUGH PLAN-

Scale: 15 chs = 1 inch.

a, b, c, d, e, represent approximately, the points of excavation whence the specimens analysed were derived.

REPORT ON LIME LAKE DEPOSITS.

By T. I. Wallas.

To the Director of Agriculture.

I beg leave to submit, herewith, report of my examination of the Lime Lakes in the Wagin District, made recently on your instructions.

Analytical results of specimens examined are incorporated in the report, and a rough plan of the locality accompanies it.

THE LIME LAKE DEPOSITS.

The district containing the lime deposits lies East of the Great Southern Railway line, in one of the upland valleys draining the interior tableland, and has an altitude of from 800 to 900 feet.

Owing to the slight general fall, and the undulating character of the country, the valley is not traversed by a defined watercourse, but several salt lakes exist, which, doubtless, at a remote period, formed a connected waterway, but now are quite distinct, and generally free from surface water.

Because of this, and on account of the great absorbing capacity of these lakes, practically no salt passes out of them.

The lakes existing on the West side of the railway line, subject to different conditions and distinct in character, are capable of being classed as fresh-water lakes containing no large excess of saline constituents.

In the Eastern lakes, however, the salines in the subsoil water—sodium, potassium, magnesium, and calcium compounds—exist to such an extent that they may be described as salt and lime lakes, the water of which, whenever present, is incapable of any economic use for stock or irrigation purposes.

Lime Lake, as it is very properly called, was officially surveyed during last year, and portions of the banks and lake bed were set apart for the leasing of the lime deposits.

Considering the importance of lime in various forms to the land of this State, and the position of these deposits in the centre of the South-West agricultural district, it was decided, in the interests especially of the agricultural community, to examine these lake deposits and determine, in some measure, their value and practicability for agricultural purposes.

The soil of the greater part of the agricultural land in this district, resulting largely from the breaking down of granitic rocks, is seriously lacking in lime.

Moreover, the soil of the country generally, soured by many centuries' growth of coarse vegetation, sodden and starved by lack of cultivation, and exhausted of many elements of nutrition by dense forest growths, calls for the use of lime—a substance needed for the growth of almost all crops as a

sweetening and drying agent, as a chemical force to release and change various soil constituents unavailable until so acted upon, and to provide nutrition for the life processes of the essential soil-enriching organisms.

Two lakes exist side by side, one much smaller than the other, separated by a ridge of limestone formation.

The main lake has an area of about 400 acres; the smaller lake an area of about 15 acres.

Under usual weather conditions, there is no surface water on either of these lakes, and there is no local record of the presence of much surface water. It is, therefore, not surprising to find that vegetation has encroached upon and covered about one quarter of the area of the larger lake, where a dense thicket of sheoak is established. Beyond the land margin of this thicket, and above the estimated high water mark of the lake, a variety of timber flourishes—yate, York gum, and jam trees on the South and South-East margins; jam, York gum, morrel, and banksia trees on the North and North-East margins. The sheaoak tends to usurp the ground on the West and South-West sides until the sand deposits check its further extension.

Several excavations in the margins and in the beds of the lakes were examined and samples taken for analysis.

The deposits in the smaller lake appear to be of a uniform character, and indicate a good quality of chalky limestone, free from undecomposed shells and mechanical admixture of other substances, both on the surface and throughout the mass.

It is fairly soft and capable of easy excavation.

The deposit outside the lake margin is of similar quality, and, although harder, can also be easily excavated. Probably this deposit runs back into the dividing limestone ridge, and is of equally good quality.

The conditions in the larger lake, in some respects, present wide differences. Passing down the somewhat abrupt slope of the dividing limestone ridge, where the stone is free and can be easily quarried, there is found outcropping a further deposit of rather hard limestone, which appears to run well inside the lake margin on the South-East side. Here there is some surface vegetation of short salt scrub.

Inside the margin of the lake, along the bed on the South-East side, there is a surface deposit of earthy gypsum whereon many salt plants thrive. Just below this surface vegetation there is a considerable deposit of loose fine shells. This extends in a wide belt for a depth of about six inches. The deposit is made up almost entirely of pure shells, showing little remaining evidence of silicates in their composition. It is quite loose, and can be picked up by the handful without the trouble of excavation, once the surface vegetation is removed.

Below this shell deposit there is an almost equal depth of dark loamy soil, and below that a soft limestone, containing undecomposed shells. At greater depth the limestone becomes more solidified and uniform until, at the lowest depth excavated (about eight feet), a deposit composed largely of gypsum, much of it in distinct crystalline form, is met with. At this point water begins to appear, and gives evidence of its saline character by the deposition of crystalline salt on the surfaces from which it is evaporated.

The body of the lake bed, except that the loose shell deposit is not present, exhibits the same characteristics, and apparently is the same throughout.

Practically, if we omit the loamy deposit underlying the loose shells, the whole lake may be looked upon as a lime deposit of varying character and quality

Some of the surveyed lots have been leased, and are being worked for limestone, which is burned in two existing rough kilns—the remains of a former attempt to utilise the deposits for industrial purposes by the production of building lime.

It is reported locally that such building lime was of very good quality, and that the buildings in which it was used give evidence of the excellent value of the mortar produced.

The present leaseholders are excavating the ridge limestone and the earthy limestone of the lake bed, and burning in order to produce lime for agricultural uses, and for the manufacture of a lime fertiliser which consists of the burned lime mixed with the deposit of sulphate and carbonate of lime, which exists as the crust of the lake bed.

The lime formations throughout give clear indications of their origin from the breaking down of the shell deposits, derived, within a period which geologists would consider comparatively recent, from a system of vast salt-water lakes left by an earlier recedence of the sea.

As the deposits are wholly shell-derived limestones, showing no traces of fish remains, a sufficient explanation is given of the absence of phosphatic salts from the specimens examined. The analytical results, provided by Mr. Mann's department, are here given:—

Analytical Results of specimens examined:

(*a.*) From excavation near the South margin of smaller lake, taken 2ft. from the surface, outside the lake bed.

(*b.*) From excavation near the South margin of smaller lake, taken 1ft. from the surface, inside the lake bed.

(*c.*) Loose shell deposit existing just below the slight surface vegetation inside the margin of the larger lake.

(*d.*) Loose crystalline deposit from deep excavation in central part of larger lake.

(*e.*) Water taken from deep excavation in central part of larger lake.

The figures represent percentages:—

	(*a.*)	(*b.*)	(*c.*)	(*d.*)
CO_2	35·78	29·52	37·70	3·36
Moisture and organic matter	7·52	14·40	2·84	19·50
Silica	9·04	8·78	9·80	4·64
$Fe_2O_3 + Al_2O_3$	10·20	9·70	4·38	3·66
Ca O	24·00	24·04	44·04	30·68
Cl_2 as Na Cl	1·55	1·91	·56	·13
Mg O	10·31	11·39	trace	trace
SO_3	·31	·43	·23	39·31

Stated simply, as effective lime constituents, these represent—

In a moist condition.

	a.	b.	c.	d.
Carbonate of Lime	42·46 ...	42·39 ...	78·36 ...	5·64
Sulphate of Lime	·53 ...	·73 ...	·39 ...	66·82

In a dry condition.

	a.	b.	c.	d.
Sulphate of Lime with Oxide of Lime	26·2 ...	28·6 ...	45·7 ...	86·9

e. Figures represent grains per gallon.

Silica	1·96
Iron and Alumina	*Nil*
Calcium Sulphate	338·66
Calcium Carbonate	44·49
Magnesium Sulphate	578·97
Magnesium Chloride	929·96
Magnesium Carbonate...	93·08
Potassium Chloride	114·77
Sodium Chloride	8188·14
Sodium Nitrate...	8·49

This, representing a water containing 15 per cent. of total solids and 13 per cent. of chlorides, is obviously useless for any general purpose unless it were found desirable to use it for the extraction of common salt, which, however, would be seriously contaminated with the magnesium salts present. It has special interest as confirmatory evidence of the origin of these limestone deposits and their derivation from salt lakes.

The present leaseholders of certain sections of Lime Lake previously submitted specimens of deposits from the body of the larger lake.

Those specimens were found to contain effective lime salts in the following proportions:—

	Surface deposit.	Deep deposit.
Carbonate of lime	63·09	5·34
Sulphate of lime	2·34	70·55

On these results it may be sufficient to remark that the whole of the solid specimens examined indicate the presence of lime of considerable value and practical form for agricultural and industrial purposes. The carbonate of lime (chalk) deposits, by burning, yield a good quality of caustic lime, which finds use both as an agricultural and a building lime.

These deposits may also be used in their natural state for agricultural purposes, and, in conjunction with the gypsum deposits, furnish excellent manurial agents.

The gypsum, by burning, yields the valuable building material known as "Plaster of Paris," which should find a ready use in the State.

Concerning the shell deposit, it may be suggested that it would provide an excellent form of lime grit for feeding poultry.

Farm Buildings at the Chapman Experimental Farm

THE WAGIN DISTRICT.

By Harry P. Woodward, Assistant Government Geologist.

Wagin is situated upon the Great Southern Railway line, 193 miles from Perth and 147 miles from Albany, at an elevation of 840 feet above the sea level.

It lies in one of the main valleys which drain the great tableland of the interior, the fall of which is so slight that in place of a well-defined watercourse a series of lakes have been formed, which only during periods of great floods overflow one into another, by which means the water eventually finds its way into the Beaufort River.

To the eastward the ground rises rapidly for a distance of about four miles, attaining the greatest elevation in the district at Badgarning Hill, which is a small range of granitic rocks about 300 feet above the level of the town.

Should at any future time a water supply of greater magnitude than that at present in existence be required, there are several sites upon the eastern slope of this hill which would lend themselves admirably for reservoir construction, from which 100 to 150 feet head of pressure could be obtained by a gravitation scheme and a good water supply assured. A striking feature of this range is that it is clothed by a distinct vegetation from the surrounding country, the flora being identical with that met with upon the Darling Ranges and around the south-west coast, whilst upon the lower-lying land all around it nothing but the tableland vegetation is encountered.

The main valley in which the town is situated runs in a north-east and south-west direction, from which the country rises gently to the north, whilst to the south and east it rises more abruptly on to sand-plains, along the edge of which polished granite knobs outcrop here and there similar in every respect to those around the lake basins of the goldfields.

Although this is one of the main drainage valleys from the salt interior, the holding capacity of the lakes is so great that without very exceptionally wet seasons occur inland little or no salt finds its way westward of the railway line; therefore the chain of lakes below it being filled locally are comparatively fresh, whilst those to the eastward, in some instances, contain salt in such large quantities as to render its removal after a long dry summer like the past a highly profitable undertaking. Upon the eastern side of this valley, running in a north-eastern direction from Lime Lake for a distance of about three miles, are some limestone deposits, which in places consist largely of small shells, whilst the surface of the adjoining lake bed is covered by a deposit of earthy gypsum.

Bonnar's Leases are situated upon the eastern side of Lime Lake, covering a portion of this lake bed, the low bank between it and the gypsum lake, part of which is also included.

Lime Lake.—This lake covers an area of about 200 acres, with limestone outcrops upon its eastern and southern sides, whilst to the westward

and northward (if these deposits do exist) they are covered with accumulations of sand. The bed of this lake is covered upon the south-eastern side by a deposit of black earth full of small shells, beneath which are shelly limestones, which give place further into the basin to an earthy limestone perforated by root-holes that have mostly been filled with earth. Beneath these superficial deposits cream-coloured, chalky limestones are exposed in an old excavation which was opened some years ago in order to obtain limestone, which was burned and used for building purposes in the town, and which, to judge by the mortar, yielded a most excellent lime. This hole has now fallen in, and as no reliable information can be obtained as to its depth, and whether or not the total thickness of the beds was tested, it is impossible to state anything definite under this head until more work has been done. The lower portion of this lake bed, upon which water lies after heavy rains, and the adjoining belt upon which salt-loving plants grow, is covered with earth gypsum, which deposit is being used in conjunction with the burnt limestone in the manufacture of the fertiliser. Upon the low ridge between this lake and the gypsum lake, which lies to the eastward, are some old kilns which are at present being used by the lessees, in which he burns the root-pierced limestone from the lake bed and some creamy limestones which outcrop upon this ridge.

In a small hole sunk in the gypsum lake a white chalk gypsum deposit is exposed, but this, so far, has not apparently been much worked.

Wilson's Leases are situated about two miles north of the lime lake deposits, upon a low ridge between lake branches; little work has been done here as yet, but to judge from the appearance of the surface stone and that exposed in the excavation for the kilns, it is apparently of very good quality and admirably suited for the purpose to which it is proposed to put it, viz., the manufacture of a fertiliser by the addition of phosphatic and other substances to the calcined limestone. The whole of this deposit, so far as examined in this district, is decidedly of lacustrine origin, apparently resulting directly from the weathering of shelly deposits similar to those met with at the surface; the occurrence of the latter proving conclusively that in comparatively recent geological times this area must have been covered by a huge lake, which, to judge by the type of shells, was in all probability salt.

A number of samples were taken and tested for phosphates, but, as will be seen from the attached analyses, they contain too small a percentage of phosphoric acid to be classed as anything but limestones. This goes far to indicate the absence of fish in large quantities; for had they been present, one would naturally expect to find a higher percentage of phosphoric acid; whilst to go one step further, this absence of fish might almost be expected in salt lakes, the water of which would be liable to vary so greatly in density owing to the intermittent character of the inflow of fresh water in a country destitute of flowing streams.

Although containing too small a percentage of phosphoric acid to be of any appreciable value as phosphatic manure, these deposits, being situated as they are, in the very heart of what is rapidly becoming a very extensive agricultural district, the soil of which, resulting as it does for the most part from the disintegration of granitic rocks, is almost destitute of lime—a most essential substance in the production of first-class milling wheat—are of considerable value, particularly the gypsum, for in that form not only lime but sulphur, a most important element in plant life, is conveyed to the soil.

The supposed coal deposits of this district are entirely of a problematic character; a considerable tract of country which was once a large lake bed exists, but whether coal measures exist beneath the modern superficial deposits or not can only be proved by boring or sinking. Since no outcrops have so far been discovered, before any such work were undertaken, it would be necessary to have geological survey made of the area in order to prove the extent of the area over which coal measures might extend.

Gold is reported to have been discovered in some hills upon the northern side of the lake area, about 17 miles to the eastward of Wagin. The country in this locality changes decidedly in character, the red soil indicating the presence of horn-blended rocks, whilst the hill itself is composed of feldspathic rocks, which at the surface is too much weathered to exhibit any structure. These rocks are intersected by numerous small quartz and ironstone veins, some of which have been opened up by pits and small shafts, but the parcels of stone tested did not prove of a sufficiently encouraging nature to warrant further expenditure upon them. The stone, in places, is of a very promising character, and is well worth prospecting in an inexpensive manner by simply dollying surface stones until gold is discovered; then by trenching in an east and west direction across the strike of the rocks to locate the lodes, which will probably be found to consist of a network of small leaders in a belt of dyke stone, the quartz being probably highly mineralised below the water level.

Appendix A.

The following are the result of analyses of your specimens from Wagin:—

		Phosphoric anhydride. P_2O_5.	Calcium sulphate $CaSO_4$.	Calcium carbonate $CaCO_3$.
871	Siliceous limestone, ridge lake side, surface	·008		
892	Siliceous limestone, ridge lake side, under surface	·014		
873	Siliceous limestone, under shell deposit, lake bed	·010		
874	Siliceous limestone, old lime pit, lake bed	·026		
875	Calcareous clay, gypsum lake	trace	·96	41·58
876	Calcareous earth, gypsum lake bed	trace	1·07	52·26
877	Siliceous limestone, Wilson's low ridge excavation	·008		

Calcium carbonate is the only constituent present in sufficient quantities to be of value for fertilising purposes.

Appendix B.

Phosphatic Deposits in general.

As an introduction to this subject it may be as well to mention that the bones of all vertebrates are composed of phosphates of lime, and that all skin, feathers, hair, nails, hoofs, and scales are rich in phosphoric acid, whilst even the fleshy portions of the body, more especially the brains and nervous system of all birds, beasts (including man), and fishes (particularly the latter) contain phosphoric acid.

It will be seen from the above that it is absolutely necessary that man be supplied with phosphate of lime, and as he does not eat the bones of his prey he must look for his supply of this substance from some other source, the most convenient being found in bread, since all cereals contain phosphate of lime, particularly in the outer skin of the grain which is now generally discarded as bran and pollard.

Since cereals contain phosphate of lime it naturally follows that the soil upon which they grow must be furnished with it, otherwise after a few crops have been taken off a piece of land its productivity will be exhausted. Other substances such as nitrates and potash are just as essential to plant life, but here only phosphates are being considered.

Now, since phosphate of lime does not occur in large quantities in the average soil, if crops requiring it are grown year after year it naturally follows that it must be supplied. This, of course, can be in the form of crushed bones or guano, but since the supply is limited and the demand great, other sources of supply must be considered.

It has been now discovered that certain rocks, rich in phosphoric acid, but which in their natural state are practically useless as a fertiliser, become of greater value after treatment by chemical process which renders the insoluble phosphate of lime soluble, and thus available as a plant food, when it is called a superphosphate. When the term phosphatic deposits is used, it is generally understood to refer to a combination of phosphoric acid and lime, sometimes called rock phosphate. But although the term is generally applied to the above, phosphoric acid also occurs in combination with other elements, commonly such as lead and iron, in the latter of which forms it has played an important part as one of the best known phosphoric fertilisers of the world, namely:—Thomas' phosphate, or basic slag, being a pulverised slag resulting from the conversion of phosphates of iron into steel by Thomas' process.

Phosphatic deposits as they occur in nature may be divided into two classes, those divided from mineral and those from organic sources. The former of these comprise deposits resulting for the most part from the disintegration of certain volcanic rocks rich in the mineral apatite (phosphate of lime). The second, which embraces by far the most numerous and most important, may be classed under two heads; the first being fossil phosphatic deposits and the second altered recent deposits.

The fossil phosphates are mostly met with amongst the mesozoic rocks, where beds resulting from deposits formed by large fish-eating reptiles occur, called coprolites; whilst the more modern are limestone which have absorbed a considerable quantity of phosphoric acid from overlying guano beds; and as these latter are by far the most likely to be met with in this State, it will be necessary to consider them more carefully.

Deposits of phosphate of lime of this class are very similar in every respect to ordinary limestones, and since they contain the phosphoric material in an insoluble form they are of no particular value as a fertiliser until manufactured, and in consequence exhibit no evidence of their existence by increased vegetation. Therefore if deposits of limestone are met with along the coast, or even at a considerable distance inland under the following conditions, they are well worth testing.

Since these limestone deposits, which contain a large percentage of phosphoric acid, in some bygone time have formed the camping and nesting

ground of sea-birds, they must at such periods have been near the sea, either on the top of cliffs, ridges of rock, or islands; whilst now, as the coast-line is rising rapidly, and has been for a considerable period, if they exist at all, will be found inland upon the hilltops or sides at a considerable elevation above the sea-level, or as isolated hills upon the coastal plains. If patches of limestone are found in the hollows or areas of depression, there is small chance of their proving to be rich in phosphoric acid, as they are in all probability late deposits; and the same remark may apply to the coastal coralline limestone hills, which are recent wind-formed deposits.

When the fact is borne in mind that similar phosphatic deposits are being formed at the present time from Geraldton northwards along our west and north-west coasts, it is highly probable that similar deposits to those met with upon York's Peninsula, in South Australia, will be discovered in this State.

FODDER PLANTS.

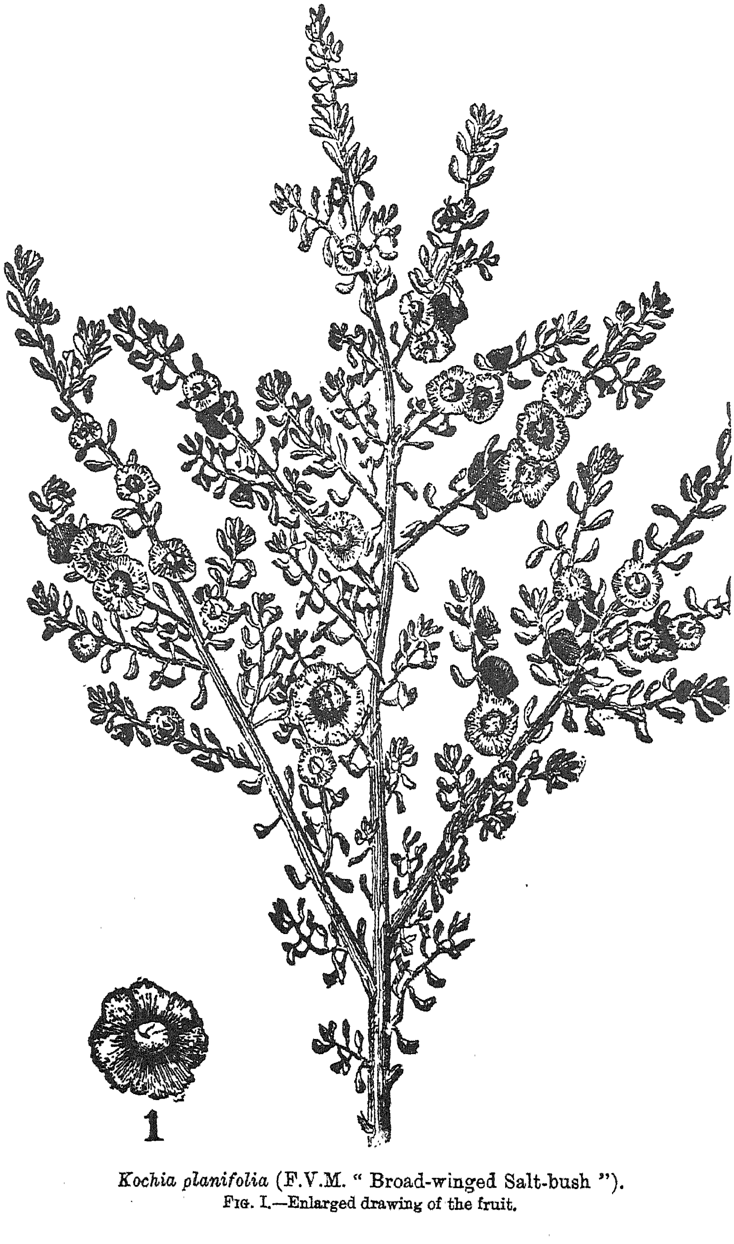
CHAPTER II.

WESTERN AUSTRALIAN SALT-BUSHES.

(*Continued.*)

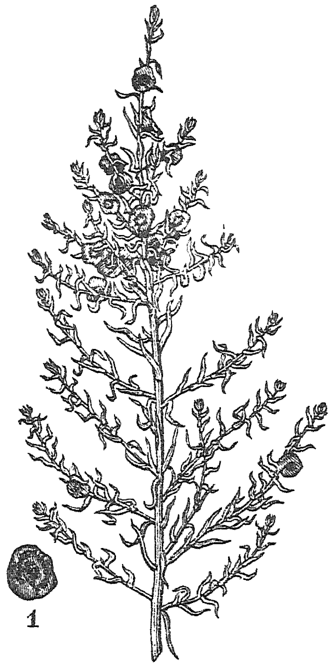
Kochia villosa (Lindl. "Salt-bush.")—An under-shrub of erect, spreading, or decumbent habit, more or less covered with a silky, villous tomentum. Its leaves are alternate, linear, thick, and soft in the typical form, and about half-an-inch long. There are about half-a-dozen varieties differing more or less from the typical form, though not of sufficient distinction to warrant their being classed as distinct species, notwithstanding their geographical distribution over the continent being considerable. This salt-bush is peculiar to the inland plains and is capable of withstanding a long period of dry weather. Cattle and sheep greedily eat the plant when it is young, and often crop it down close to the ground so that it gets little chance to produce seed for its perpetuation. When left unmolested for a time, however, the plant produces an abundance of seed which, when ripe, germinates readily under ordinary conditions.

Rhagodia billardieri (R. Br. "Salt-bush.")—A branching, straggling, or erect shrub, sometimes attaining a heigat of six or more feet. The leaves are about an inch long, usually green above when full grown, and pale or whitish underneath, somewhat variable in shape, but usually oblong-lanceolate.



Kochia planifolia (F.V.M. " Broad-winged Salt-bush ").
FIG. I.—Enlarged drawing of the fruit.

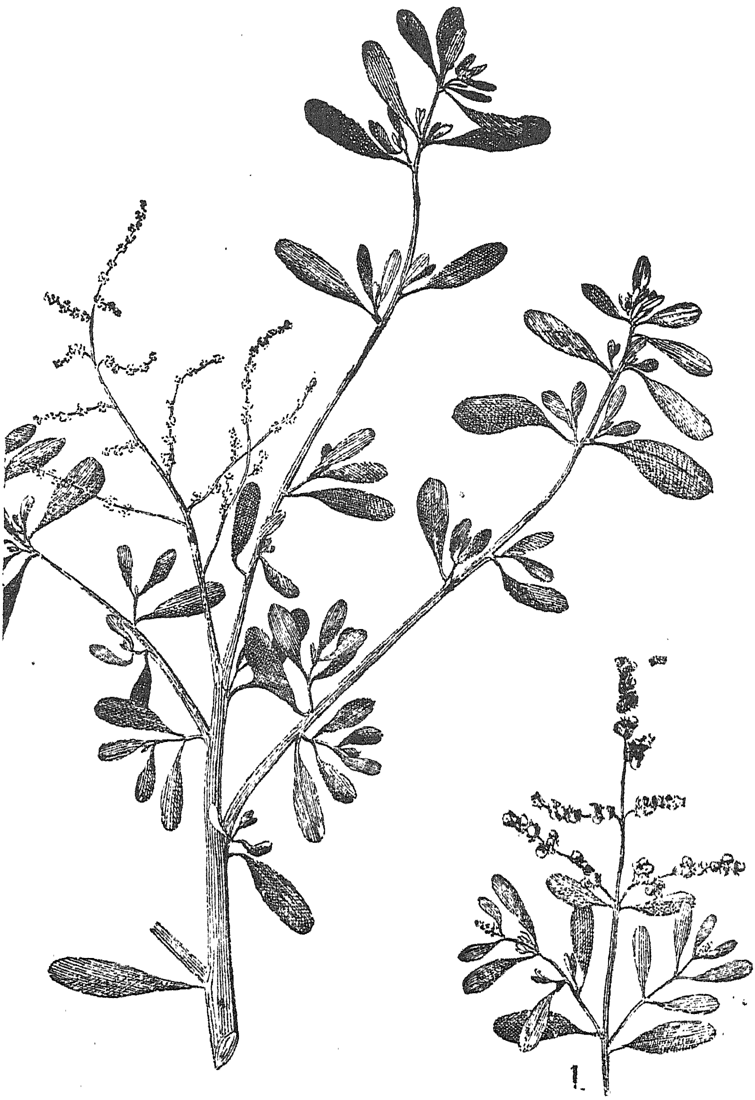
This shrub is found only in the coastal districts, and sometimes on the brink of the ocean; it is neither affected by the severest gales nor by the spray from the sea. At one time it was growing abundantly along the coast, but



Kochia Villosa, Lindl.—" Silky salt-bush."
FIG. I.—Enlarged drawing of the fruit.

where cattle have had free access it is gradually disappearing. Most animals are so fond of its succulent stems and leaves that it is often cropped down close to the ground, and has little chance to recuperate or produce seed for its natural reproduction. This salt-bush is easily raised from seed and it can be readily propagated by cuttings made of the half-ripened wood and put in the ground in the ordinary way. It is well worth encouraging on the littoral sands, which it would help to bind and prevent being carried inland by the fury of the winds that blow from the ocean.

Rhagodia nutans (R. Br. " Salt-bush ").—This is a herbaceous, prostate or procumbent plant, with slender stems usually spreading from one foot to three or more feet long. The leaves are opposite, or here and there alternate, arranged on slender stalks, and somewhat variable in shape, but generally broadly hastate, with prominent basal lobes, the lower ones about one inch long, but the upper ones get gradually smaller towards the inflorescence. Whilst young the foliage is more or less mealy white. Where this plant is not too closely fed down its prostate stems often carpet the ground for a considerable distance, which prevents the evaporation of moisture from the soil near its roots. This, of course, enables the plant to withstand a long period of dry weather with impunity. It is an excellent forage plant for all



Rhagodia billardieri (R. Br. "Coastal Salt-bush.")
FIG. I.—Fruiting branch.

Suffolk Mares. Chapman Experimental Farm.

herbivora, sheep being particularly fond of it. Under ordinary conditions it bears an abundance of seed which germinates readily either in spring or autumn.

Rhagodia nutans, R. Br..—" Nodding salt-bush."

FIG. 1.—Enlarged drawing of the fruit.

To Messrs. F. and C. Bennett, the proprietors of the *Town and Country Journal*, the writer's thanks are due for these excellent engravings of grasses and salt-bushes, which have been prepared at their establishment.

WINE DISEASES.

By A. Despeissis.

When these notes appear, vintage will be pretty well over, and the newly made wine will have started on that process of maturing which in due course of time should bring out those qualities which the consumer and the connoisseur look for in the fermented juice of the grape. The old proverb that "there is many a slip 'twixt the cup and the lip" seems to fitly represent the many vicissitudes the newly made wine encounters during that mellowing process.

For ages past many empirical methods have been resorted to for preventing diseases and for restoring to wine those qualities which through neglect and accident it may at times have lost.

Many of these empirical methods, when examined under the searching light of modern scientific knowledge, can now be either recommended as rational and permissible or condemned as useless or dangerous.

What these methods are which in practice have proved efficacious, and modern scientific researches have proclaimed as sound and reliable, it is the object of these notes to indicate.

Prevention better than Cure.

One point will appear obvious to those who feel interested enough to give some attention to this matter, and that is, when dealing with wine diseases more especially, "prevention is better than cure."

Definition of Wine.

Whatever subject is taken up, the first matter for consideration is to acquire as clear a knowledge as possible regarding its nature. As regards wine, the definition, the most acceptable of many which have been proposed, is:—

The result of the alcoholic fermentation of the fresh juice of grapes.

It is found that, although wine can be defined in a few words, it is nevertheless eminently complex in its nature. It varies with the kinds of grapes and even with the same varieties of grapes grown under different conditions of climate and of soil. Vintages from any given vineyard also vary according to the changes of the season; the time of picking; the manures used, and a number of causes which operate in imparting differences ever so slight to the intimate composition of the grape.

In a like manner, other outside influences make themselves felt during as well as after fermentation. Some are chemical, some microbial in their nature, and each in turn is readily modified by conditions which, although little apparent, nevertheless impart considerable influence to the wine itself.

In the following table, which gives the composition of fresh grape must and the substances it is made of, the corresponding composition of the

resulting fermented wine due both to transformations and to transmutations of the ingredients of that fresh grape juice, is also shown :—

GRAPE-JUICE, BEFORE AND AFTER FERMENTATION.

Must.		Wine.		
	Water			Water
		Chief products of fermentation.	Alcohol.	Ethylic
Substances susceptible of fermention.	Glucose			Propylic
	Lævulose			Butylic
	Inverted sugar			Amylic
	Other sugars			Œnanhic
				Glycerin
			Acids.	Succinic
				Glycolic
	Gums and dextrines			Sugar traces
	Pectic matters			Manna
	Fatty and resinous matters			Ethers
	Colouring matters			Gums and dextrines
	Tannin			Pectic matters
	Malic acid			Fatty and resinous matters
	Tannic acid			Colouring matters
	Tartaric acid			Œnocyanin
	Racemic acid			Tannin
	Citric acid			Malates
	Lactic acid			Tartrates
	Acetic acid			Valerates
				Butyrates
				Acetates
				Lactates
	Carbonic acid			Carbonic acid
Mineral matters.	Sulphates	Mineral matter.		Sulphates
	Phosphates			Phosphates
	Nitrates			Bromides, Iodides
	Chlorides			Potash
	Bromides, Iodides			Soda
	Potash			Lime
	Soda			Magnesia
	Magnesia			Lithia
	Lime			Manganese
	Lithia			Iron
	Manganese			Albuminoid matters.
	Iron			
	Albuminoid matters			

CHEMICAL INFLUENCES.

It is thus seen that grape must, as also the resulting wine, are highly complex liquids. The full composition shown in the above table is given more with the object of emphasising that fact upon the reader than with the view of bewildering him with a nomenclature of chemical substances.

Some of these substances, it is noticed, are only detected after fermentation, and can be picked out from those which remain unaltered.

It is easy to understand that variations in the several amounts of these substances, caused by any of the natural or artificial conditions enumerated in a previous paragraph, are capable of altering the character of wines.

One can also readily see that several of the substances enumerated, as soon as they have been brought intimately together, after the juice has been pressed out of the berries, and when some have been evolved during the process of fermentation, must set up chemical actions which will alter their composition and that of the liquid containing them.

Most of these chemical changes will take place slowly and gradually during the refining process of maturing.

Apart from the influence of time, that brought about by changes of seasons is also noticeable.

During the cold winter months, some of these chemical substances become less soluble than is the case in a warmer liquid, and such salts as cream of tartar are cast from the wine and settle down with the lees and also against the sides of the cask.

Oxidation also proceeds more or less rapidly as the wooden staves are thicker or thinner and a greater or a lesser bulk of the liquid is subjected to the influence of air.

This leads to combinations between the alcohols and the acids in the wine, and to the production of ethers and certain definite and characteristic bouquets which matured wine show so distinctly.

It is thus evident that, considered from a chemical point of view, wine is an ever-changing liquid, although these changes generally take place slowly and gradually.

Biological Influences.

From the foregoing, it is to some measure easy to understand that the idea of manufacturing wine artificially by uniting its several elements to form the finished compound, or in other words by synthetic process, may have appealed to some. To the wine-faker more especially the idea is a most attractive one. It is so much more easy and so much cheaper to bring together in definite proportions, which chemical analysis reveal, patent spirit, rain-water, tartar, glycerin, succinic acid, the several mineral constituents mentioned in the table above, colouring matter, ethereal essences, and, on the other hand, so much more expensive and inconvenient to grow grapes and ferment them, rear the wine, and bring it to the state of brilliancy desired by trade.

The attempt, however, may it be said in glorification of pure wine, has always landed the wine-faker into financial loss or branded him as a rogue.

It is evident that forces other than merely chemical forces are at work during as well as after wine-making.

Until the moment the grapes are crushed, and the juice and the skin are mixed together, those hidden forces remain dormant. The moment, however, the grape berry is crushed, life enters it.

But life is brought by germs, and those germs occur in great numbers in the air around and also on the waxy bloom which covers the grape skin. There it is set by wind or rain ready to be transformed into organisms capable of multiplying and of doing certain work when placed under certain conditions.

These microscopical bodies are as greatly in evidence in the wine cellar as they are in the cheese or the butter factory. Some are useful and assist in breaking down the sugars in the grape juice into as much ethylic or, as we

understand it, "pure" alcohol as possible. Others are less useful, and their presence results in less ethylic alcohol and more of the other alcohols named in the table above, alcohols which, in every day speech, are referred to as "impure" alcohols.

Other germs again produce neither pure or impure alcohols, but further break down these alcohols and the result of their invasion is "pricked" wine, or mawkish, bitter, greasy, putrid wines, or in a general manner of speaking, diseased wines.

Some of these morbid germs are present on the grape skin itself alongside the useful yeast germs; if fermentation is properly conducted, they won't increase, if carelessly conducted they may outnumber the useful yeast, and cause trouble due to defective fermentation. Other germs are introduced with unsound grapes which may be affected by fungus diseases or "rots," a word which expresses several diseases of fungoid origin grapes suffer from. Others again lurk in the cracks and joints of tainted, fermenting, or storing vessels; these are not introduced by the grapes themselves.

In the course of subsequent chapters, some light will be thrown on several of these organisms which set up diseases in wine.

The old proverb that "familiarity breeds contempt" may be said to find application here, as by getting familiar with their nature we get to better know how to attack germs of disease, or better still, how to guard against them.

Preserving Substances in Wine.

After we have realised what a complex liquid wine is; when we understand that slowly and silently chemical reactions go on in its body from the time it is made; that germs of many kinds float and live in it, it certainly seems strange that wine should, after all, be a fairly stable commodity, and that, given fair treatment, it will keep, mature, and improve with age.

The reason is that the living germs already mentioned are easily kept in check by counteracting agents, and that some of the constituents of wine itself, no matter how minute they may be, act as a deterrent against their invasion.

Alcohol, tannin, glycerin, the natural acids of the wine, all in their own way, act as preserving agents, when placed under favourable conditions.

Alcohol, for instance, which, exposed to the air in doses such as we find it in wine is rapidly converted into vinegar, remains, provided air be excluded from the casks or the bottles, practically unchangeable, and is a well-known preserving agent.

Tannin is deadly to some germs even though attacked by others, and so is glycerin.

Acidity, favourable to yeasts, the active agents of alcoholic fermentation, offers a valuable check against germs of the microbe types which are in a general sense inimical to the conservation of wine.

How to maintain unaltered into the wine these preserving substances should be the aim of the cellarman.

Much can be done by means of cleanliness and exclusion of air in sound vessels, but considerable help is at the same time afforded by the use of such antiseptic substances.

Of these a number are known, but most of them are deleterious to health, and on that account their use is illegal.

Amongst the number, one in particular is recognised as efficacious and at the same time safe to use and harmless to health, provided it is used with discrimination. That substance, known under the several names of sulphur fumes, sulphurous acid, and sulphur dioxide, will often be referred to in the course of these notes.

(*To be continued.*)

A STARLING SCARE.

Under the heading "Beware of the Starling," the following letter appeared in one of the morning papers a couple of weeks ago:—

"To the Editor.

SIR,—When coming into town to-day Mr. F. A. Giles mentioned that he had seen yesterday (Sunday, February 18) a pair of starlings on a dry tree at his place, at Guildford. He tried to borrow a gun to shoot them, but could not get one. He says that he is sure that he is not mistaken, as he knew the starling well in South Australia, where it is rapidly becoming a worse pest than the sparrow. As further evidence, he says that he asked a neighbour if he had seen any starlings about, and if he would know them. The neighbour had not seen any, but said he would know their whistle anywhere, and on being taken to the place, recognised the note before seeing the birds, which he afterwards recognised by sight. Presuming that there is no mistake, no effort should be spared to kill all the starlings now existing, before they multiply. It would be cheap if it cost a thousand pounds a head to destroy them.—Yours, etc.,

W. CATTON GRASBY."

Perth, February 19.

In bringing that letter to the notice of the Director of Agriculture, Mr. A. Despeissis, the Government Horticultural and Viticultural Expert, reported as follows:—

"My attention was directed on Friday last to the attached letter published in Thursday's issue of the *West Australian.*

"On Saturday I called at Mr. F. A. Giles's residence at West Guildford for particulars, and to ascertain whether the alleged Starling had been satisfactorily identified.

"Mr. Giles had already left for Pingelly, where he now resides. Mrs. Giles could not tell me anything about the birds, nor does she know who the 'neighbour' mentioned in the letter is.

"Should you write to Mr. Giles, and ask him for that witness's name and address. I will make further inquiries.

STARLING—*Sturnus Vulgaris.* From an imported specimen; half natural size.

"Other neighbours, who are well acquainted with the Starling, tell me they have not noticed that bird, but that Wattle Birds are now plentiful about the locality, wherever there are grapes and figs ripening.

"Mrs. Giles told me that the birds were certainly destructive and were seen feeding on grapes on the vines.

"The contention that 'it would be cheap. if it cost a thousand pounds a head to destroy them,' is, to say the least, a dangerous one to advance, as there are enough rogues about, ready to introduce undesirable pests for the purpose of winning an easy reward offered for their destruction, without tempting them unnecessarily.

"Our inspectors, amongst many others, are quite prepared to undertake the duty without looking for the reward, and I would suggest that someone well acquainted with starlings be sent to the locality named to search for the birds and shoot them. Mr. Whittington, one of the inspectors under the Insect Pests Act, would, the Chief Inspector tells me, do his best to attain that end.

I suggested to the Sub-Editor to photograph, at the Perth Museum, a Starling and a Wattle Bird, side by side, and publish decriptions of each bird, to enable the public to sound a timely note of alarm, based on reliable authority, if ever they come across Starlings in Western Australia.

In accordance with the recommendation submitted to the head of the department, the director of the Perth Museum was approached for leave to photograph a mounted Starling and two specimens of Wattle Birds of species common in our orchards.

That work was entrusted to Mr. Pether, the Government Lithographer, and the following illustrations show the birds reproduced half-size:—

The wings of the Starling appear to droop more than they do in live specimens, when the longer wing feathers known as the "primaries" are carried higher, as shown on the wattle birds, and show part of the flanks, thus imparting to the bird a smarter appearance.

The Starling is described by ornithologists as a passerine bird of the family *Sturnidae* and genus *Sturnus* or *S. vulgaris*, Europe.

"The common Starling or Stare is one of the best-known British birds. It is 8½in. long when adult, black, of metallic lustre, iridescing dark green on some parts and steel-blue purplish or violet on others, and variegated nearly throughout with pale buff or whiteish tips of the feathers. The wings and tail are duller black, the exposed parts of the feathers frosted or silvery, with velvety-black and buff edgings. The bill is yellowish and the feet are reddish. Immature, winter, and female birds are less lustrous and more variegated with the ochery or tawny brown, and have the bill dark coloured. Starlings live much about buildings, and nest in holes of walls, crannies of rock, openings in hollow trees, etc. They are sociable and gregarious, sometimes going in large flocks."

Similar in many respects to the common Starling of Europe are the Australian Wattle Birds, of which two half life-sized illustrations are given.

They are long greyish birds, with longitudinal white marks upon the plumage. One kind bears blood-red wattles and the other has none. Both specimens were shot in the neighbourhood of the Swan.

Like the Starling, they are both insectivorous and frugiverous according to seasons and as the opportunity offers. They are also gregarious and

migratory in their habits. Hall, the ornithologist, says that these birds have a wide vocabulary, from an unpleasant guttural noise to one pleasant to a limited degree.

The Red Wattle Bird (*Acanthochæra carunculata*), Lath. (*Akantha*), a spine, a thorn; *chæra*, representing a genus of perching birds; passeres *carunculata*, a fleshy excrescence,) has for principal colours grey and brown, with white longitudinal marks; wattles, blood red. This bird is a native of South Queensland, New South Wales, Victoria, South Australia, and the South-Western division of Western Australia.

As regards the Little Wattle Bird (*Acanthochæra lunulata*), it has no white streaks to the gold feathers of the mantle and has no wattles. The bird is indigenous to Western Australia.

DAIRYING.

Old and New Methods.

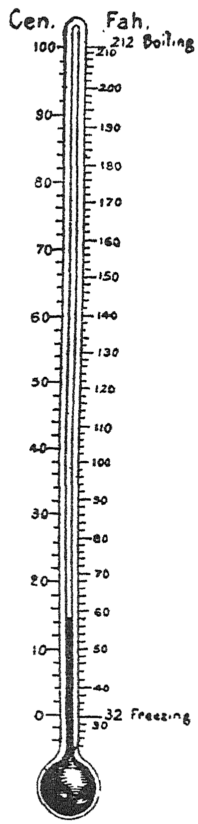
The dairying industry within the past seven years has advanced from being a comparatively small and insignificant branch of farm work to a position of importance second to none in the Eastern colonies, not only on account of the money that it brings in, but also because of the quickness of the returns. Monthly accounts are the general rule, but among some farmers, who make their own butter instead of sending their milk to the creamery or factory, the terms are cash weekly from the agents. In fact, until of late years dairying was looked down upon, at least by the male portion of the community, and if any of them were asked about how the cows were milking, the reply would be, "Ask the old woman! She attends to the butter-making." On their part, the women folk were not slow to recognise, to a certain extent, the advantages of this state of affairs, and they claimed as their perquisite the money obtained from the sale of the dairy produce. When the factory system came to be introduced, this was one of the principal objections that was urged against it by the women—that they would not get money then as in the past, and in many cases it was hard work to overcome it.

It was not difficult to show that under the new method of working women were the most benefited by the change, and we would ask to-day: "What is the position of a woman who attends to a moderate-sized dairy, run on the old-fashioned lines?" With many it is a drudgery that few of the negroes in the old slave days were subjected to. It may seem a simple matter to attend to a dairy under the old system, to those who have never tried it, but the work is not only much of it hard, but it is continuous, commencing early in the morning and continuing on until often all hours of the night. The following is about the routine:—Up early in the morning

Red Wattle Bird—*Acanthochæra Carcunculata* (Lath.) Half natural size.

milking, when that is over, straining and setting the milk, then washing and scalding all the milking utensils. After breakfast, skimming the dishes, then feeding the calves with skim milk, again washing and scalding dishes —no mere "wipe round," as every good dairy woman knows, but a thorough good scrubbing. Then comes the churn, washing it out, scalding, and cooling it; then the churning, in the cold weather keeping at it hour after hour, and the butter will not break, or in the hot weather the cream swells up and fills the churn with froth, and when the butter does come it is so soft and oily that the buttermilk cannot be worked out of it, and it has to be put away to harden, which means getting up next morning, perhaps about three or four o'clock, to salt it and get it printed in time to send to market.

The mere physical exertion in working butter on the old system with the hands, especially in winter, was downwright hard work, and with some almost a matter of impossibility, not having what are known as cold hands. Some persons seem to have naturally hot hands, and do as they will, they cannot prevent the butter sticking to them and getting greasy, while others can work the butter and have no trouble of that kind at all. Now all this handling either is, or ought to be, a thing of the past, as butter-workers are made that can extract the buttermilk and thoroughly incorporate the salt much better and more quickly than can be done by hand. Then there came another general wash-up of churn and all connected with it. Under this old system, with many life was a mere existence, hardly worth living—toiling and slaving week days and Sundays, Heaven only knows how many hours a day! In the days of ignorance there was, perhaps, some excuse for this state of things, but there is certainly none now-a-days. Dairy information is spread broadcast over the land, the cream separator has taken the place of the old-fashioned milk dishes, the butter worker has done away with the handling of the butter and labour of salting. By the old methods, physical strength was required; under the new, brains and skill. With those who make their butter at home, a good deal of work still remains, but the improved churns, the use of a thermometer, and the working on recognised lines, instead of by rule of thumb, has reduced the work to a minimum. But to dairy in the most profitable way, the milk should be taken to a factory or creamery, or if there is none sufficiently near, the milk can be separated and the cream sent twice or three times a week to the nearest butter factory, as there the cream can be looked after and attended to in a way that is not possible on the farm, unless expensive machinery is erected. There is also this advantage in having butter manufactured at the factory, that a more regular and uniform article can be turned out than when it is made at home. Where butter is made from the milk of a comparatively small number of cows, if one of them eats anything that affects the milk, the butter is more apt to be tainted than where the milk of



Daily Thermometer.

a great number is blended, or at least the taint is more easily detected. Again, unless a proper place has been built for keeping the milk or cream, the probabilities are that taints of many kinds will be absorbed by the cream while waiting for churning; while at the factory suitable arrangements are made for the care of the cream from the time it comes in to the factory until it is packed ready for the market in the form of butter.

Much discussion has arisen at times as to the comparative merit of first-class home-made butter and first-class factory. All things considered, the home-made butter will probably satisfy the taste of a connoisseur better than the factory, for the reason that more delicate flavours are to be found in it at times. All the cattle supplying milk on the farm are probably grazing on the same pasture, and if it be rich in clover or particular kinds of grasses which give a flavour to butter, it will be much more distinct than where the milk is mixed up with that of other cattle that are on different pastures. But however the home-made butter may at times surpass the factory, it can never compete with it for regular and uniform quality. Under the old system a considerable amount of skill was required to make passable butter, and as no rules were laid down that people could go by, every one was a law unto him or herself, and this deterred very many from going into dairying, not knowing how to make good butter, and not having the means of learning at their disposal. A considerable amount of expense is required under the home system, as it is not much use trying to make good butter without having a convenient dairy and the requisite dairy utensils.

But here comes in the great advantage of the modern method. Anyone with ordinary common sense can start dairying with a fair chance of doing well at it. The milking is perhaps the hardest work attached to it, and even that after some practice becomes comparatively easy. With a factory near at hand, all the dairy work can be done with a few milk tins and milking buckets. Many persons who have been brought up in the towns, and who have longed to go out into the country, have been deterred therefrom on account of not knowing anything about farming. If they can only secure a piece of fairly good grass country they need not fear to commence dairying with a few cows, and as they gain experience with the few they can be improving their land and increasing their herds at the same time, and feel assured of at least a good living and a healthy life. It opens up the way for those to go on to the land who could never have done so before, because with a few cows to start with they have an assured income that will keep the house going, while it leaves time for them to improve their land or grow other crops, the returns of which will be so much clear profit. In the other colonies to-day there are hundreds on the land doing well, notwithstanding the bad times—the agricultural depression and low prices—who, were it not for dairying, would to-day be simply existing as workmen in some of the large cities on a mere pittance, but who now, with their families, can live in comfort.

But in all this, one must not go away with the idea that dairying is easy work. In one sense it is, but it is very binding work also—night and morning, wet or dry, hot or cold; Sundays and during the week the cows must be milked, and milked at regular hours. Want of regularity interferes greatly with the yield of milk, and to get the best returns the temper of the master, and all who come about the cattle, must be kept in check. A good

dairy cow is a delicate, fragile machine in the hands of man, that very little will put out of order and destroy its utility.

In this country at the present time, with the thousands of acres available in the southern districts that can be obtained on the most liberal terms ever offered anywhere, with a good soil and a good rainfall, any man, married or single, with the desire to make an independence for himself, can do so, and with a less amount of hard work than could be done on the land in any other part of the world. With the rapidly-growing population it will be many years before the supply here will be equal to the demand, and those who go in for dairying in the early days of the colony's prosperity are the ones who will obtain the "cream." Owners of large properties in the southern districts could not do better than sub-divide them and let them on a sharing system, supplying the cattle and farm, and getting so much per cent. of the gross returns from the dairy produce. The calves could all be reared, and would be quiet and lay on flesh better than if reared in the bush. In the other colonies this is looked upon as by far the most profitable way of dealing with the land in many districts.

As to whether a person should go in for dairying solely and on a large scale depends upon many things—the district in which he is situated, the amount of his capital, and on the quality and quantity of the land at his disposal, and also on his taste and judgment for cattle. But it may be safely said that there is no farm in the Southern District of Western Australia on which a moderate amount of dairying would not pay, and in conjunction with it poultry and pigs would help considerably to swell the yearly income.

One important fact should constantly be kept in mind in dairying, that a few cows, well looked after, will pay much better than double the number neglected.

Laying out the Dairy Farm.

The ultimate success of dairy work will depend to a great extent on the farm and how it is laid out, the soil, the rainfall, and the water supply. It is quite possible to make a living on a poor farm badly attended to, but every dairy farmer wants to make something more than a mere existence. There is an old saying, and a very true one, "Poor land makes poor farmers," and it keeps them poor too. If a person can afford it, it is better to pay a fair price for good land than get bad land for nothing. It is most discouraging for the worker on a poor farm to see his neighbour, who does not work nearly so hard as he does, always having better crops, his cattle always in better condition, and the whole family in better circumstances. Of course, there will always be some farms that are better than others, but while land is so plentiful and cheap there is really no excuse for a man going on bad land when there is so much good available at the present time.

Those who are intending to settle on the land should not be in too great a hurry to do so without having a good look round to see which are the best districts. If dairying is to be the sole or main industry, secure land in a district with a good rainfall and as temperate a climate as possible, with good natural water, if available, and good drainage. If a good flat or two can be secured, so much the better. The advantage of this will be felt in growing summer fodder. The farm should be undulating, but the hills not too steep. Although a temperate climate is the best adapted for dairying, if the factory system is at work it will not matter much if it is rather on the

warmer side, provided the rainfall is good and there is plenty of water available. Some of the most successful dairies are in hot districts, where water is plentiful and green feed is grown all the summer through by means of irrigation.

The soils in this colony differ so much from those of the Eastern colonies that a new-comer is apt to judge by appearances, and neglect land that is sandy and think it is valueless. Anyone who has not actually seen the results obtained from some of the sandy loams here could not credit the amount of crop that is grown upon them. Make inquiries from those who have been in the district for a considerable time as to what the capabilities of the land are. When a farm has been secured and the improvements been gone on with, do not ring all the timber. Leave some growing here and there for shelter as well as for appearance. It is often said that stock do not need any shelter in this or that district. They may do well running about without it, but they will do much better with it and amply repay any attention in this direction. Milch cows require shelter from the heat of the summer's sun and from the cold, bleak winds of winter, and they should never be put into a paddock that is not provided with it. If the trees are such as do not afford a good protection, plant some quick growing ones in clumps that will. In commencing dairying, attention should be given as to the means of getting milk to a creamery or cream to a factory.

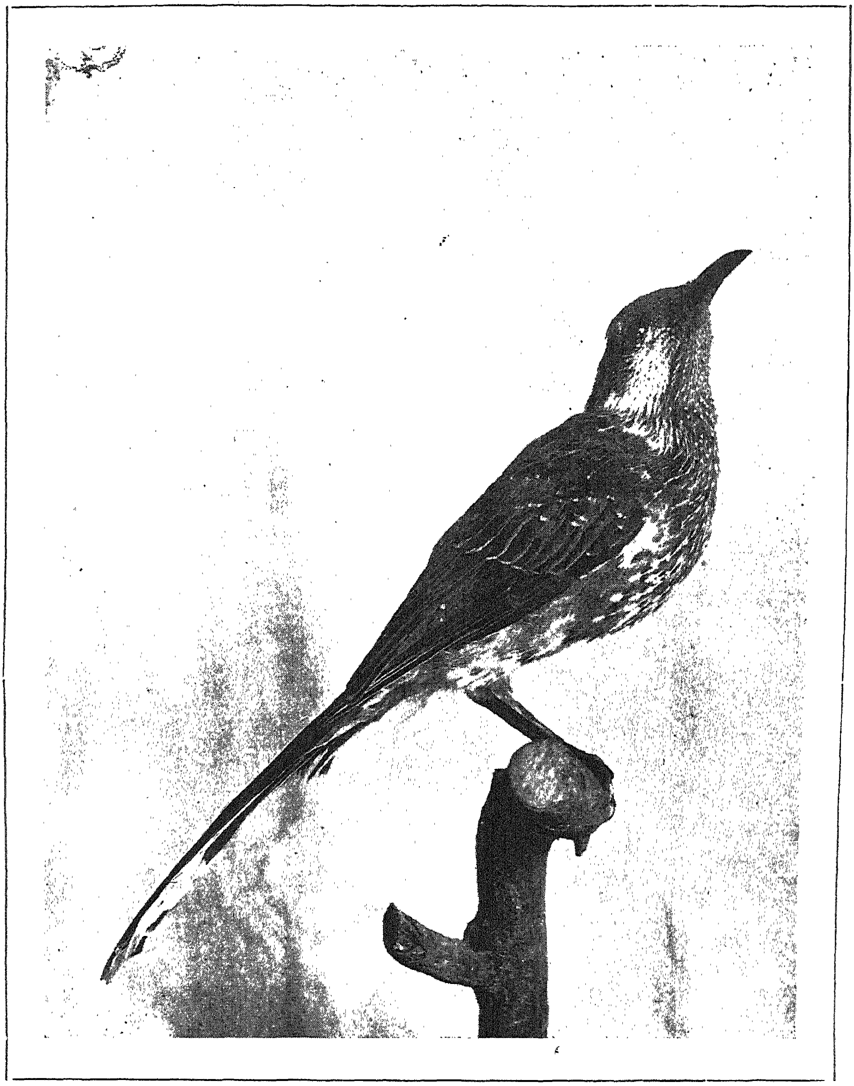
It is not much use starting to dairy if the farm is so far away, or the roads so bad that it is impossible to send the cream either to the railway station or butter factory, unless the farmer is prepared to invest a fair amount of capital in dairy appliances. If the dairy is a large one, it will pay well to do that, especially if cheese-making is gone in for.

Where it is possible, it is well to have the milking yards nearly in the centre of the farm, so that all the paddocks may be available for the cattle with as little exertion as possible.

Above all things, if you wish to live at peace with your neighbours, see that your fences are thoroughly sound; even if they cost you a little more to put up, the money is well spent, and will be repaid to you a hundredfold in days to come.

Do not go in for large paddocks, as cattle like a change of pasture frequently and do much better if they are moved from paddock to paddock without being kept in one until everything is eaten out of it. If the cattle are treated thus they will fall off in their milk, and although it may increase again when they are put on better feed, still they will never do as well as if they had not been allowed to fall away. More feeding value will be obtained from the small paddocks when they are not allowed to be eaten down too close and the cattle are continually walking over them. The various grasses that come in at different periods of the year will have a chance of coming forward and providing food that would otherwise have been nipped off at the start. Land treated in this fashion will carry nearly half as much more stock as it would in large paddocks.

Try and arrange that your yards shall be on the slope of a hill, so that they may be well drained and all surface moisture be readily got away. If there are any large trees growing on the proposed site, if they can be used for shelter from the sun, by all means let them remain. The difference in the behaviour of cattle in the summer time in a sheltered yard and one



LITTLE WATTLE BIRD—*Acanthochæra Cunulata* (Gould). Half natural size.

without it, needs only to be seen to be appreciated. In the one where shade is available the cows may be seen contentedly either standing or lying down chewing their cud; in the other, exposed to the sun's rays, they are restless, whisking their tails about, tossing their heads, and every now and again rushing one another, and all the time uneasy and out of temper, which means that when they come to be milked the milkers will get out of temper also, to the great loss of the dairyman. Have the milking bails well under cover, so that when being milked the cows may be protected from the weather, and if possible have the milking sheds darkened, then in the summer the flies will not be nearly so troublesome, and thus save much irritation to both man and beast. See that the bails are securely erected, so that when young cattle are being broken in they may not break away and thus give more trouble afterwards. In fact, let everything about your farm that cattle have anything to do with be substantial and solid.

Do not encourage your cattle in bad habits; they learn them soon and easily enough. For instance, do not put a crop for fodder in with only an apology for a fence round it. Some of the cows will soon see that if the fence is not ornamental, neither is it useful, and will find a weak spot and get through. If one gets in others will soon follow, and when they are discovered there will be the usual shouting and chasing and the cattle rushing through the fence without looking for the place they came in. Much damage will probably be done to the crop, the cattle will be worried and excited, and worse still, they know the fence is weak, and whenever they are near there again they will break in. Nor is this the worst feature; they have learned to break fences, and they will break down or through fairly good fences by keeping at it, pushing and pulling with their horns until something gives way. Many cows, old in the knowledge of fences, will walk round one and pick the weakest parts with as much certainty as a man would. If the fences are good, so that stock cannot get through them, they will soon cease to try, and much petty annoyance will be saved. I wish to speak strongly on this subject of substantial fences, for only those who have kept quiet milch cows, or have lived among neighbours who do, can have any idea of the amount of ill-feeling they continue to create among neighbours who would otherwise be on most friendly terms. An outlay of a few pounds, or a few days' extra work at the beginning, would have saved the trouble. In a country like this, one may think it does not matter much, as the feed outside is not much better than the feed inside. Quite true at present, but it will not be always so. The agricultural people have scarcely awakened in may districts yet to the possibilities around them; but this will not long continue, and where only native grasses and scrub are now growing, in a few years or less will be cultivated land, and the good fences will be needed then, and remember that once a fence is up, if it is not the right kind, there is but a small likelihood of its ever being made right until a new one is needed in its place through its days of usefulness having expired, and this may only be expected about once in a lifetime. Do not use slip-rails; lazy people coming into a paddock are apt to leave them down or not put all of them up, or put them up carelessly, and cattle soon learn how to take them down themselves. Of course, they can be made fast—pegged or locked—but as boys are often sent to bring in or out the cattle, something attracts their attention and the fastening is overlooked, and perhaps in one afternoon many pounds' worth of crops may be destroyed. Several strong and cheap gates, as well as all classes of fencing, have frequently been published in the *Journal*. Wherever

cattle are kept all fences should at least have a top rail; if they have two, so much the better, but a top rail and six wires will make a very good and economical fence. A paddock should always be made to keep the bull in, and the fence of this ought to be made extra high, with at least two rails, or better still, three. In laying out the paddocks, if there is not natural water available, wells or tanks should be sunk, say where four paddocks join, in the corner of one. By doing so one set of troughs will do for all four, as they can be moved through the fence into whichever paddock they are required; or if it is preferred to have the troughs permanently fixed, one set of troughs set close alongside or partly under the fence will serve two paddocks.

The cultivation paddock should also be so arranged as to adjoin three or four grass paddocks, when, in case of green feeding or ensilage-making, the cattle could be fed with the least amount of labour of carting. Much time, money, and trouble might be saved if, instead of laying out the farm haphazard, as careful attention were given to it as in the laying out and building of a house. There is no sense in having to cart feed a mile or two when it need not be carted a quarter the distance. Neither is it a wise thing to cart green stuff to a silo a mile in one direction when it has to be taken perhaps two miles in another afterwards. I can fancy I can hear many farmers say, "Sure, any fool knows that," or, "Does he take us all for idiots?" No, I do not; but for the past ten years, having had a very close connection with farm life, inspecting farms, reporting on them, and judging them, I can say that many farmers act as though they had no brains at all, and often make their horses and themselves walk a mile with a load when 100 yards would do; and my experience has been that few farmers sit down and consider how to lay out their farms so that they may be worked to the greatest advantage and at the greatest saving of labour. This State being young, and many of the farms not having been laid out, I would draw particular attention to the necessity of working to a plan. Go over your farm, carefully examine it, and see where you will build your house and outbuildings, where you will cultivate, and then lay it all out on paper and see how you can subdivide it so as to work economically and to the best advantage. You may not perhaps be able to complete your plan for years—never mind, keep on working with that end in view, and ultimately you will reap your reward—having a farm where no unnecessary expense is required to work it.

Dairy Buildings.

Owing to the scattered population in the farming districts of this State, for some years to come most of the milk will be separated on the farm, and either the cream churned there or sent to a factory. This being so, it will be necessary to have a dairy of some kind to keep the cream in, and the cooler the dairy can be kept in summer the better will be the result in making the butter. Many expensive plans have been recommended, but none I have seen answer better than those I will describe, and the buildings are cheap and easily constructed. One kind is built above ground of either weather-boards, slabs, stone or sun-dried bricks. A very convenient size for the produce of a small herd is 12 feet by 12 feet, which leaves plenty of room to store the cream and move about. The walls eight feet high, and the roof should have a good pitch, the length of the rafters being, say, three-fourths the width of the building. The dairy should be ceiled with tongued and grooved softwood if available, if not, hardwood can be used, but it should be lined with calico to prevent dust dropping down. In both gables, above

the ceiling, there should be louvre windows or shutters that can be opened or shut at will, so that after a hot day, if a cool breeze comes at night, the cool air may be allowed to circulate over the ceiling. In the dairy there should be two windows, and these lined with wire gauze to keep out insects. If the windows are hinged, so much the better, as when required to be opened they will allow the greater draught. The windows should be of such a size as will allow the light to get in and keep the dairy bright and cheery. Sunlight is a splendid disinfectant, and no dairy should be kept dark. Another reason for having the dairy bright is, that dirt and all kinds of offensive matter may be seen at once. If the dairy is dark it will rarely be kept as clean as it ought to be. The floor, where possible, should be of stone, concrete, or bricks, with a fall in one direction, so that it may be thoroughly washed and easily dried. A small gutter running along the low side with an exit through the wall will be found to answer well, as then plenty of water can be used and get away freely. The roof should be of shingles, or if they are not available and good bark can be obtained, it will answer the purpose. A verandah all round the dairy will add much towards keeping it cool. A building erected as above would not of itself keep cool in the hot weather, but to obtain that result quick-growing creeping plants should be planted all around and trained right up over the roof. Amongst those that may be used are *dolichus* and *tacsonia exoniensis*. The common passion vine (*passiflora edulis*) may be grown with other creepers, and will give good returns from its fruit, bearing heavily after the first season. Once the creepers cover the dairy right over it will keep cool even in the hottest weather.

The other kind of dairy is one that is either underground or partly so. An economical one is made by excavating, say, to a depth of four feet and putting a wall four feet high above that, the earth that is taken out being packed up against the walls nearly level with the top. The eaves of the roof should be carried at least a foot below the wall plate. The roof should be made as described in the first-mentioned. If the ground is such that it is difficult to get a drain from the floor of the dairy, a hole, say a foot or 18 inches square and 1 foot deep, should be made at the lower corner, so that all the washing water may run there, when it can be taken out and carried away. A concrete or brick floor will be the best for this. Creepers should be grown over the roof of this dairy; also, whenever it is at all possible, water should be laid on to the dairy.

The dairy should always be at a considerable distance from the milking-yard, or any other place that gives off unpleasant smells. It should not be near the fowl-house or stable, neither should the fowls, pigs, or calves be allowed about the building. If a seperator is used it should never be worked in the dairy during the summer, for the separator gives off a continual current of heated air. A separate building, or part of the dairy verandah, may be used for separating, and the cream cooled before taking it into the dairy. On large dairy farms a little forethought in laying out the milking yards and dairy may save a great deal of labour, such as arranging that the milk may run from the milking-yards by gravitation to the separator, and from there again to the calf pens or pig troughs.

If dairying is to be carried on successfully it will be necessary in most districts that a supply of artificial feed should be produced for both winter and summer use. Green feed, such as maize, sorghum, etc., may be used with advantage in the summer, but in the winter, when the weather is cold

and bleak, the cattle will require something not so cold and watery as these, and nothing answers better than good ensilage, fresh from the pit or stack, for it is not only appetising but warm, and cattle milk well on it in winter. To have this always available it will be necessary to cultivate to a certain extent, and for this purpose some of the best land should be set apart. After the first few crops are taken off the best of land it will begin to need manure, for it is the height of folly to cultivate two acres of land if the same quantity of produce can be obtained from one ; and yet this is being constantly done. Year after year the same land is cultivated and nothing put into it to compensate for all that has been taken away, consequently new land has to be cleared and broken up so as to obtain the same amount of forage; and people complain about the land and grumble because it is not like what it used to be. Manure the land heavily, and do not be afraid to demand big returns. Take two, three or even four crops off the land in the year. It can be done if you look after it well. Wherever possible sow all crops in drills, so that the land between the drills may be cultivated and kept stirred and open as long as may be without damage to the growing crops. Keep the weeds down and the soil loose and open, and even in a dry season fair crops may be looked for, and not in vain. What is wanted is not large areas of poor land under cultivation, but small areas of rich land, and if not naturally rich, made rich--thoroughly well cultivated and forced to yield heavy crops.

A dairy farmer has other work to do than to spend half his time in ploughing and working poor land. It is a waste of time, so much extra work on the horses, so much extra wear and tear on the implements, and the results unsatisfactory. If you think it is not possible, try one acre, or even half an acre. You can get in, say, barley or rape early, and have one good cutting, probably two, then a crop of turnips or peas, and then maize, or sorghum, in the one 12 months, and see what returns you get from it as compared with the other land in proportion to the time and labour expended on it. One fair trial will convince you that there is money in it. As to the matter of what crops should be grown and how they should be treated, I will not go into that now, but will deal with it later on.

As to the permanent pastures in some parts of this State, many of the better class of English grasses might be grown with great advantage instead of couch grass, which, in nearly all other parts of Australia, is looked upon as little better than a weed, and steps taken to eradicate it and stop it spreading. Of course, the grasses that are suitable to one district are often not suitable to other districts, and experiments will have to be made. These experiments will be of the greatest value to the agriculturist and dairy farmer, as he will then have reliable information to go upon and save himself years of fruitless endeavour. In districts where there are good native grasses it would be well worth the time and labour to gather the seeds of the best of them, sow in pots and then cut for seed to be sown on the farm. Many of these grasses stand our climate much better than any of the so-called artificial grasses will, and not only so, but in the other States some of the best-flavoured and best-keeping butter comes off the pastures where the cattle are fed entirely on native grasses. With a very little trouble in a couple of years enough seed could be saved to sow a number of acres, and would amply repay the small expense.

As before mentioned, a good water supply is essential for dairying successfully, and so far as I have seen this is to be found principally in the

hilly country. Most of the hilly country is fairly heavily timbered and has a good rainfall, but would not pay to clear, and in its present state does not grow much grass suitable for pasture for cattle. Judging from my experience in other countries, I should say that if most of the timber was rung and all the scrub cut and burnt, and on top of the burnt ground cocksfoot and English rye grasses with clover were sown, in a very short time, if not too heavily stocked, there would be a magnificent pasture where the rainfall is adequate. On some of the loamy hillsides where the rainfall is 40 inches or over, other grasses might be used, such as meadow, foxtail, prairie, Timothy, and both white and red clovers. The first year the grasses should not be allowed to seed, but cattle should not be put on them until they have a firm root in the ground. In obtaining grass seeds, farmers should be careful to see that they are reliable. Poor seed is dear at any price. On rich flats that are not wanted for cultivation lucerne and prairie grass may be grown to advantage. When lucerne is sown it should always be sown in drills and kept cultivated between the rows until it is well up. On no account sow Italian rye grass, as it is not perennial, and will probably not be seen after the first season. When sowing grasses a very calm day should be chosen.

When laying out the dairy farm fence off a piece of the best land you have and sow the grasses that will thrive best in it, and reserve this for your calves, and never overstock it. A good paddock for calves will be a wonderful help to them, and even when milk is scarce they will often thrive well in it. See that there is good, warm shelter in it for winter and good shade for summer.

Selection of Herd.

We shall now proceed to describe the cattle that we have to choose from, and in doing so I would ask my readers to bear in mind that it is a dairy farm that we are writing about, and what would be suitable for a dairy farm may not suit general farming, nor would the animals that are most profitable in general agriculture pay on a dairy farm.

There is no hard and fast rule that can be laid down as to what kind of cattle is most suited for dairying. Dairying may be divided into three kinds, viz.: First, producing milk for daily consumption; second, producing milk for butter-making; third, producing milk for cheese-making. These three divisions may be considerably mixed up, and often are. Thus, a dairyman may make butter at one time of the year, and find that at another time it pays him better to make cheese. Or, he may make butter when milk is plentiful, and find that it pays him much better to sell his milk when it is scarce. So the kind of dairying to be adopted will have to be considered in establishing a herd of milch cows. Nor is this all, the character of the farm itself must be taken into account. If the feed is poor, or the land very hilly, no one need expect success from large-framed cows, which have to keep walking about all day long to try and fill themselves, never having a moment for rest. The amount of nourishment required to keep up the wear and tear upon the muscles is so much taken from the milk, represented either by a smaller quantity, or less butter fat. Where a large-framed beast would be always poor, a smaller beast might thrive and do well. On rich pastures, where there is plenty of feed, put on as large cattle as you wish, but never put them on the hills and poor country. Where a cow has to walk about all day she does not even get the good of what she eats; to get the full benefit she should have time to lie down and chew her cud. When eating, cows to

a great extent simply bolt their food for the time being; and as soon as the cravings of hunger are over they lie down and masticate it all over again thoroughly, when it then passes into the stomach and is properly digested. If a cow has not time to thus fulfil the provision of nature, much of her food passes through without being properly digested, and this is a dead loss to the cow and her owner. Every effort an animal makes exhausts a certain amount of nourishment, therefore the less exertion made the greater quantity of nourishment there will be available for milk and cream. As to the different kinds of cattle that are available for dairying, nearly all the various breeds can be utilised, with the exception of the Polled Angus and Devons, and I have heard of individuals of this latter breed giving good butter results, but it is very exceptional, and for all practical purposes they may be left out of our consideration.

We would then have Durhams, or Shorthorns, Herefords, Holsteins, Ayrshires, Alderneys, and included in these are Jerseys and Guernseys, as in these States these three separate breeds are rarely kept distinct. Kerries and Dexter Kerries—so far as I can find out, I do not think there are any of the two latter breeds in this State, but lately they have been introduced into the hilly districts of the Eastern States, and with great success. Then we have the various crosses of all the above breeds, and we continually meet with people who tell us that the crosses are far superior to the pure-bred cattle for dairy purposes. Against that we have the fact that all the great records ever made have been from pure-bred cattle, carefully bred for many generations. Thus we have the pure-bred Jersey cow, "Lily," at five years old, giving 23 quarts of milk a day, and yielding 24½lbs. of butter in the week. Then we have three pure-bred cows, Ayrshires, belonging to the Duke of Westminster, that gave 1106 gallons, 1110 gallons, and 1448 gallons respectively in 12 months; this last one being at the rate of almost 16 quarts per day the whole year through. There is also the record of three Holstein cows at Troy (N.Y.). One gave an average of 27 quarts a day, another 28½ quarts, and the third 29⅓ quarts per day during a week's test. The first one gave 25·2lbs. of butter for the week, the second 23.7lbs. and the third 28·75lbs. These were not only good milkers, but two of them had won prizes in the open class at the New York show, for Holstein cows. No records from cross-bred cows that I have ever seen or heard of come near these. Not that I would for a moment deny that there are good cross-bred dairy cattle. I have known what are called common cows give as high as 16 and 17lbs. of butter in a week, but pure-bred cattle have beaten their records, and from a pure-bred beast you are far more likely to get a calf that will inherit the milking properties of its mother than you are from a cross-bred. All dairymen will know as a fact, as well as all breeders of any kind of stock, that if you breed from cross-bred stock you never can tell what the result will be. It may take after its sire, or after its dam, or it may strain back for generations to a great-grandsire, dam, or even farther.

I am not by any means advising dairymen to go to the expense of purchasing a pure-bred herd right off; but, what I would strive to impress upon each and all is, to use only pure-bred bulls in their herds, and see that the bull is from a good milking strain, even if one has to give a seemingly big price for him. His cost will be nothing compared to the herd when the heifers begin to come in. Let no one think when he commences dairying that he can go and buy a good dairy herd right off. It may happen that a fair herd can be purchased at a *bonâ fide* clearing sale, but that is only a chance in a lifetime. The probabilities are that if you are a fair judge of cattle

about one out of every four you buy will be fit to keep and rear calves from. The only sure way to get together a really good herd is to breed it. You will have to buy the best you can get to start with, then pick out your cows according to how they turn out, and have the heifer calves from the best, and making sure the bull is from a milking strain and pure-bred. By doing this, in a few years you can get together a really good herd, and, by judicious culling, every year it will be improving and the average yield gradually rising. The best investment that can be made for the dairy farm is a good bull. Even with poor cows to start with no man need despair of getting a fair herd together if he can only obtain a milking strain on the sire's side. It is then only a matter of time and careful selection.

The Channel Islands Cattle.

Of these we have three subvarieties, viz., the Jerseys, Guernseys, and Alderneys; but they are often indiscriminately spoken of, and in many shows are all shown under the name of Alderney. There is a difference in them, more as regards colour in the case of Jerseys and Alderneys, as in size and form they are the same; but the Guernsey is a larger-framed beast, and coarser in all its points, and is seldom self-coloured, being generally fawn-coloured or yellow, with patches of white. They get the credit of being heavier milkers than the others, the milk being equally rich. They are not often found outside the Island of Guernsey at present, as mostly all breeders have gone in for the more graceful types found in the other islands.

For a great number of years these cattle have been noted for the richness of their milk and the fine quality of their butter, and have been particular favourites for families keeping a cow for their own use, not only for their milking qualities, but also on account of their quiet habits and handsome appearance. It is a strange fact, that of all cattle the cows of this breed are the most docile, and the bulls the most wicked and uncertain in their tempers. Of late years many herds have been established and kept pure both in the United Kingdom and the United States for dairy purposes only, and have returned very good results. The one great objection to them is that as a rule they are more delicate and require more care and attention than any of the other breeds. In Australia when on good pasture they thrive and do well, and in many places are used for crossing purposes to improve the quality of milk, and the young stock seem hardy and much better able to thrive on coarse food than the pure-bred animals. The milk of this breed is more adapted to butter-making than for cheese, being rich in butter fat, and the fat globules so large that the cream rapidly rises to the surface, and when the milk is used for cheese-making there is generally a considerable loss of butter fat.

While on the subject of Channel Island cattle mention may be made of the Brittany, as a number of them have been imported at one time and another into the Australian colonies, but never seem to have taken well with the public generally. They would be admirably suited to many of the hilly and colder districts, being small and active, very hardy and good foragers, yielding large milk returns for their size, and of good quality. They do not stand nearly so high as the Jerseys, and have very short legs and are of much thicker build. Their colour is either black, or black and white.

The Holstein-Fresians.

Of late years these cattle have become remarkably popular in America, and for quantity of milk given in twelve months, and best return of butter

for the same time, held the world's records. They were originally Dutch cattle, and have been bred with great care and attention in America until they far surpass the original stock both in appearance and milking qualities. They are very striking in appearance, having large frames and a glossy black colour with white patches. The steers are said to make very good beef. In the United Kingdom they have never obtained a footing, being considered delicate and subject to all the diseases that cow flesh is heir to. At one time they, or closely allied stock, were largely kept in the dairies around London, but the death rate was so high that the dairy people gave up keeping them. This has not been the experience of American breeders, nor of those who have kept them in Australia, and at the present time they are very largely used for crossing by many of the most experienced dairymen in Victoria. Their milk is not very rich, but is quite equal to the average quality, and the amount given in one day frequently reaches over 20 quarts, and sometimes 25 and 27 quarts. They have, as a rule, good teats and are easily milked, are quiet and docile, and bear house-feeding well. Not many have been imported into the colonies. Young bulls bring good prices, and are well worth the money paid for them, many of the half breed cattle almost equalling the pure in quantity and often excelling them in quality. To be kept successfully they must be well fed and not have to wander far in order to fill themselves. Their milk is well suited for cheese-making. The last of the dairy breeds that we have are the

Kerry and Dexter Kerries.

These are a purely Irish production, and are about the smallest cattle known. In height they are frequently not more than 36 or 37 inches, and their udder reaches so near the ground that sometimes it is rather difficult to milk them. They are generally pure black in colour, but sometimes they are found of a rich blood red. They are docile, very hardy and active, can climb hills almost like goats, and will live and thrive where other breeds would die of starvation. For their size they are the greatest milkers of any of the dairy breeds, often giving four or five times their own weight of milk in a single season. When crossed with other cattle they generally degenerate as milkers, but the cross bred stock show a great adaptness for laying on flesh, which is of the finest quality. A few of them have been introduced to Australia, but the prices asked for their stock put it out of the reach of most dairymen to obtain them. They are so admirably suited for the hilly country and poor districts that it is a pity there are not more of them in the colonies. For use in private families they cannot be surpassed, and are very economical to keep.

As the breeding of pure bred stock is not within the reach of all dairy farmers, the question will naturally arise as to what are the best crosses, or what is the best breed of bull to introduce into a herd. So much depends upon the class of cattle that we already possess that no hard and fast rule can be laid down, at the same time certain lines may be followed with advantage. Thus, if the cows are hardy and good milkers, and it is desired to improve the quality, a cross with some of the Channel Island breeds will probably have very good results. If the cattle are not very good milkers, and generally a weedy lot, the Ayrshire might be used; or, if small in size, a shorthorn from a good milking strain. A really good all round cross is that between the Ayrshire and any of the Channel Islanders. They are good, useful, all round dairy cows, whose milk is fairly rich in butter fat,

and suitable for either butter or cheese. Some magnificent milkers have been the produce of Jerseys and Holsteins, and are remarkably handsome cattle to look at.

I have given up to the present a general idea of what the characteristics of the various breeds of cattle are; but even if pure bred cattle only are kept they will need most careful culling to keep them up to the highest standard. Only the calves from those that prove themselves by actual test ought to be kept, and those that do not come up to the fair standard should be sold or got rid of at the first opportunity. A good beast eats no more than a poor one, but may give double the return in cash in a single season. Every cow in a herd ought to be thoroughly and constantly tested, not only for quantity and quality, but also for her staying properties. Some cows will give, shortly after calving, a great quantity of milk for a few weeks and then drop off until the yield is very small, while others will only give a moderate supply at first, but will keep it up for months with little or no falling off. Any cow that does not give at least 3·6 per cent. of butter fat is not good enough to keep, and should be replaced with a better animal as soon as possible. By attention and culling in a very few years it is quite possible to bring a herd up to a standard of 4 per cent. to 4·4 per cent. of butter fat in their milk, while specially good cows may go up as high as 5 or 6 per cent. of butter fat; these, however, are very few and far between.

Feeding Dairy Cattle.

One of the most important things for a dairyman to remember is, that the returns he gets from his cattle are greatly dependent on the food provided for them and the treatment they are subjected to. If cows are neglected in the winter time and kept in cold, bleak paddocks, without shelter, they will not yield anything like the returns they would if properly cared for. In fact, they would thrive much better if they had less food and more warmth. It is very poor policy to starve or neglect a cow in winter, thinking she can make it up in the spring, for in the first place the cow has to make up flesh again before she can be expected to come to her full milk, and that is a tedious and wasteful process. It is much easier to keep a cow in good condition than to get one into it. Again, if the cow is dry she will probably be in calf, so that a great deal of extra nourishment is required; or it may be that she is in calf and milking also, and in that case the strain upon her system is very great, and unless properly looked after, the cow, the calf, and the milk returns will suffer. It will pay much better to keep fewer cows, and see that they are properly attended to and have plenty to eat, than to keep more that are continually on short rations. There is one mistake that many dairy farmers make, and that is, they think that the *quality* of the milk can be greatly improved by feeding very rich foods. As a matter of fact, experiment has shown that the food has very little effect on the quantity of butter fat in the milk. A cow, by good and judicious feeding, may be made to increase the quantity of her milk up to 50 per cent. or over, but if the milk is tested the percentage of butter fat will be found to have changed but little. Some years since the writer made the experiment as follows:—Three good milking cows about two months calved were taken, each averaging 12 quarts of milk a day on ordinary grass feed. They were put into a small paddock, and in the mornings given a large bucket of bran that had been steamed, with about four pounds of treacle added to it. They then had as much chaffed green maize as they would eat; at noon they had a bran and treacle mash again, and chaffed oaten hay mixed with chaffed

maize; at night they had a mash of maize meal and treacle and chaffed oaten hay and maize. One cow steadily increased in quantity for nine days, and from 12 quarts per day went up to $19\frac{1}{2}$. The amount of butter fat in her milk, as shown by a Babcock milk-tester before she was put on extra rations, was 3·8 per cent.; at the end of two weeks the milk went only one per cent. higher, giving 3·9 per cent. Another cow increased to 18 quarts in eight days, and there was no increase in the percentage of butter fat. The third one before the experiment gave 4·2 per cent. of butter fat, and at the end of two weeks, when she had increased to 20 quarts, her milk was found to be two-tenths per cent. less, only giving 4·0 per cent. butter fat.

Of course, the total yield of butter for the week in each case was very much greater than it had been before, but that was on account of the extra quantity of milk the cows gave, and not due to the increase in the percentage of butter fat. The experiment was kept up for a month, and the percentage of butter fat varied very little after the first fortnight.

A similar result took place among the suppliers to a large butter factory in the Western district of Victoria. A number of farmers bought ten tins of treacle among them, and fed it to their cows night and morning. When the milk was tested they were greatly astonished to find that there was little or no increase in the percentage of butter fat, and immediately charged the manager of the factory with swindling them. There was a great row, and the suppliers refused to furnish any more milk to the factory, unless they got what they called fair play. The manager tested a quantity of milk in their presence, but they were not satisfied. and then said the tester was wrong. At last it was decided to obtain the services of one of the Government analysts. He came down and tested the milk, and proved that the manager was correct, much to the disgust of the farmers; but they all admitted that the quantity of milk had increased considerably, but they did not reckon that the increase was equivalent to the extra expense. That this is approximately correct almost anyone can prove for himself. Suppose you have a Jersey cow, and that she is in poor condition and on poor feed, you will find that although she gives very little milk it will always be rich in cream. The quantity may increase or fall off, but the milk will always be rich. From the foregoing it will be seen how important the question of feeding is in order to get the best returns possible from the cows. Of course, it will not pay to feed cows on a large scale with as much bran and chaff and treacle as they can eat, at prices such as are quoted for them now, but both in summer and winter milch cows should have something more than can be obtained in the ordinary grass paddocks. For summer feed a good supply of green fodder should be grown, and in almost any part of this colony, with a little care and trouble, green feed could be had at almost any time of the year, or if it cannot be grown, an excellent substitute can be used in the form of ensilage, of which I shall speak later on. For winter feed something more nutritious is needed, and if bran is not too expensive it is one of the best winter fodders, so also is maize, boiled or steamed until it is quite soft. At that time of year what is wanted is some food rich in carbo-hydrates to supply warmth and make up for the extra amount of animal heat is required. A really first-class food for milking cows in winter is ensilage made of good, sweet, oaten straw and rape. The rape and oaten straw are put in the silo layer about, and the dry straw absorbs a great deal of the juice from the succulent rape, so that when it comes to be taken out the whole mass is of a green colour. One winter I fed about 100 cows on this mixture, all the winter

through, and never had better results. The silage was taken fresh out of the pit in the morning and fed direct to the cows. Coming out fresh it was warm, and the cattle not only milked well, but kept their condition remarkably well. They had the same ration at night also, each cow getting on an average about 30 pounds of silage a day. They also had the run of grass paddocks with fair grass in them. Another good, useful winter fodder I found to be oaten chaff and green barley, the latter also chaffed, mixed up together about 24 hours before use and put in a heap and allowed to heat, and then fed warm to the cattle.

Good results were also obtained from maize stalks that had been gathered and carefully stacked and protected from damp after the cobs had been taken off. These were cut up in the chaffcutter and mixed with green cape barley or green oats, and allowed to heat; also fed warm to the cows. On each of these mixtures the cattle milked well, and kept their condition all through the winter. For summer feed ensilage was found to be excellent, especially the sour ensilage, although the cows did very well on the sweet ensilage, but not so well as on the former. The best crops for dairy cattle, to be fed in the form of silage, are maize (chaffed), sorghum (chaffed), peas and oats, or peas and barley, oats, wheat, and cape barley.

For direct green feeding all the foregoing were found excellent; also lucerne (where only milk is required for use, but not if it is to be made into butter or cheese, as both these are tainted by it) and mangolds, and on a piece of river flat one can scarcely get a better return from any crop than from the long red variety, and no crop will more amply repay care and trouble than mangolds. Manure heavily, do not leave them too close, cultivate often and deep, and keep all weeds down. Thirty to forty tons per acre is no unusual crop if well looked after, and for summer feed when the grass is dry it can scarcely be surpassed. They may also be used in winter if chaff or bran is mixed with them.

Pumpkins, and the still more humble pig-melon, chopped, and fed into chaff and bran, are not to be despised. The latter can be grown anywhere perfectly on newly broken land without any care or attention, and yield an enormous return, and come in at a time of the year when succulent feed is most scarce.

Potatoes are also good feed, and they have the property of making the butter very firm. Turnips are not good for dairy cattle, as they taint milk, butter, and cheese, and the taint is so unpleasant that few people care even to use the milk. Ensilage has also been charged with tainting milk, but if it does it is not when it comes from the cow. If milk is allowed to remain for some time in the cow-shed, and ensilage is lying about, it will certainly absorb some of the taint from it. If, however, it is taken away from the milking-yard or shed immediately beyond the smell of the silage there will be no taint from it, and the butter made from the milk resembles that made from spring grass.

If the district where cows are kept for dairy purposes is devoid of salt naturally, it ought to be always kept in troughs within easy reach of all the cattle. Rocksalt is not so good as the ordinary salt, and the cattle will take just as much as their systems require, and will thrive and milk much better than if kept without it. Before leaving the matter of feeding, it may be of some advantage to give a few hints on ensilage-making, both in pit and stack.

Ensilage.

If the average farmer a few years ago had been asked, "What is ensilage, or silage?" very few could have given an intelligent answer, but now probably 90 per cent. would have a very good idea of not only what it is, but also how it is prepared.

It is unfortunate that the knowledge thus possessed is not put into more general practice, and the loss to dairy farmers more especially converted into gain by a free use ensilage. If dairy farmers generally could only be induced to try the making of ensilage for one season, and compare the returns obtained from their cattle for that time as against the results of previous years, by comparison with the outlay in capital and labour, very few of them would ever be without a supply on the farm again.

Silage comes in useful for feeding nearly all the live stock about the farm. The milch cattle—the young stock—the calves, horses, pigs, sheep, and even poultry and geese, seem, after a time, to like it, especially if it is green and juicy. Brood sows, while suckling their young, do very well on it with other food as well, for if that is not supplied they get thin, as the ordinary silage is deficient in the fat-producing constituents, although this can be overcome by growing proper crops.

At the present time probably those who suffer most from not using silage are the milk producers who sell milk in the cities. As a rule, there is no good pasture near enough for the cows to go out to daily, and where they are allowed to graze on the commons the feed is rough and not at all calculated to cause a good flow of milk, or even keep the cattle in good condition. Consequently, other food has to be bought, mainly chaff and bran. An objection may be raised by those engaged in the trade that they have no farms on which to grow crops, but it does not require a farm to grow sufficient ensilage to feed twenty or thirty head of cattle. Three or four acres of land could easily be rented close to our large towns that would grow enough to do away at least with the use of chaff and to reduce the bran ration by at least one-half. At all the urban and suburban dairies there is always a good supply of manure, and this could be carted to the cultivation paddock and ploughed in in due time. Maize could be sown in the proper season, or, if the land is naturally damp, amber cane or some other of the various varieties of sorghum. The reason for suggesting the latter is that a second or even a third cutting may often be obtained and may be used as green feed, or cut for silage as desired. Maize will yield a heavier crop, if well manured, than a single cutting of sorghum, but if more than one cutting of the latter be secured it may more than make up the difference. In sowing the maize it is always well to put it in in drills and cultivate afterwards, as long as it is possible without injury to the plants. The seeds should be sown close together in the drill so as to have the stalks thin and easily cut and eaten. Treated thus, and well manured, a return of at least twenty tons of green fodder per acre might be looked for, and if this is made into ensilage that amount of feeding matter, less a very small percentage of loss, may be looked for. That means that twenty cows getting between thirty and forty pounds of silage per day could be fed for two months, or giving them fifty-six pounds per day, it would last them forty days. Six acres properly looked after and well manured could be made to keep twenty cows for a year, and only a small quantity of bran or maize meal would have to be purchased.

STACKING STRAW. Chapman Experimental Farm.

Notwithstanding all that has been written about the use of silage, there are many still who refuse to believe in it. A gentleman in England some little time ago made the following experiment. He had a 26-acre paddock of English rye grass, one half of which he made into hay, the other into silage. Twenty cows in full milk were then taken, and to ten he fed as much of the hay as they would eat. The other ten got as much of the silage as they wanted. The experiment was carried out for some months, and the silage was found to last quite three times as long as the hay. During the time of the experiment the silage-fed cattle gave much more milk, and kept up the quality, than those fed on hay. Outside persons were asked to compare the conditions of the cattle, and they all gave it in favour of the silage-fed. They were in better condition and their skin softer than the hay-fed animals. The result, therefore, was that the silage-fed beasts gave more milk, were in better condition, and were fed three times as long from 13 acres of land as those that were fed on hay produced from the same area. With some, thinking that ensilage taints the milk, there is still a prejudice against it, and there is no doubt that milk sometimes is tainted by ensilage, but that is not through the cow eating it, but through carelessness on the part of the milkers.

Some time since a farmer who had invested a considerable amount of capital in making silos wrote to me saying that he had gone to all this expense on my recommendation, and the result was that he had only lost his time and money and all his crops he had put into the silos, but the creamery he sent his milk to refused to take it, as the milk smelt of the ensilage and spoilt the butter. I wrote telling him it was a matter of impossibility, and in reply I was asked to come and see for myself. I gladly availed myself of the invitation, and arrived late at night. Next morning I went out to the cow-sheds and saw the men feeding the silage to the cattle. It was brought along the cow-sheds in a cart, and was lifted by the men into the feed-boxes by their hands. As soon as all in the shed were fed the same men started milking without washing their hands. The first thing they did was to milk a little on each hand to wet it and then start milking, and every now and again they would dip their fingers in the milk. When the milking of that lot of cows was finished, a distinct flavour of silage could be smelt in the milk. That lot of cattle were turned out and another lot brought in and fed in the same way, but before the men started to milk I said they should wash their hands with soap in warm water. This was done, and the milk was perfect and without the least trace of the smell of the silage. After that the silage was fed to the cattle with a fork, and the hands always washed before milking; and now that farmer swears by silage, and has twice obtained the prize for the best silage in the district. No one need have the slightest fear of tainting the milk, no matter how much is fed to the cattle, if the milk is not allowed to stand near the silage, and thorough cleanliness and common sense are used.

The use of silage is far beyond the experimental stage, and on most of the farms in England a silo is considered one of the most useful adjuncts of the farm. In America and Canada it has come into general use, not only for the milch cows but for general fattening, and the results obtained from the use of silage and straw or a little mixed meal have resulted in giving much better results at less cost than any other feed.

In the report of the Ottawa experimental farms there is a full account of a series of experiments lasting over several years, in which the silage-fed

steers gained in weight 35·8lbs. per head more, and cost $2\frac{3}{4}$d. less per day for feeding than those fed on hay, roots, straw, and meal; and on the average for two years the cost for food consumed per 100lbs. increase in live weight was 64·64 per cent. greater in the ration of hay, roots, straw, and meal than it was in the ration for silage, straw, and meal.

The actual rations were:—No. 2: consisting of cut hay, 20lbs.; roots, 40lbs.; straw (cut), 5lbs.; oilcake, 2lbs.; ground peas, 2lbs.; ground barley, 2lbs. Total, 71lbs.

No. 3.—The silage ration consisted of corn silage, 50lbs.; straw (cut), 5lbs.; oilcake, 2lbs.; ground peas, 2lbs.; ground barley, 2lbs. Total, 61lbs. Thus the gain in feeding the latter ration for every 100lbs. the beasts put on was 35·36 per cent., or a saving of £35 14s. in every £100 spent. In the face of facts like these the wonder is that the use of silage has not become universal in this State, where there are such long and dry summers, and such a scarcity of feed for at least four or five months every year; and at the present price of cattle and sheep it would pay to top them up on a similar ration, provided the farmer grows all the feed himself, letting maize and meal take the place of oilcake.

The result of a long series of experiments in feeding milch cattle at Chicago was also strongly in favour of the use of ensilage, not only as regards the increased quantity of milk obtained, but also in the saving in the cost of feed. For fattening purposes it was found that corn or maize silage was deficient in the quantity of fat-producing food, and what is known as Robertson's mixture has been found to give good results. It consists of whole plants of Indian corn, horse-beans (*Faber vulgaris*), and the heads of sunflowers. This mixture should be composed of about ten tons of Indian corn to two and a half tons of horse-beans and one ton of sunflower heads. To obtain these proportions a quarter of an acre of sunflowers and half an acre of horse-beans should be grown for each acre of maize. It gives good results for either milch or store cattle, but, for the latter, requires some meal added to it. Many farmers object to the making of silage on the score of expense, thinking it is necessary to make expensive pits. This is a great mistake. First-class silage can be made in stacks with very homely appliances. At the same time there is no doubt that a pit is most convenient, nor is it at all necessary to go to much expense in the construction thereof. In good solid clay lands, if not wet, only a foot or two of the top need be boarded up, or waste timber from the sawmills can be used for slabbing if the soil requires it. For weighting many contrivances are used, some very expensive if not very effective, others very simple and effective also; such as throwing back some of the earth, using logs or posts and rails. One of the most convenient forms of applying pressure, if a windmill is available, is to have several iron tanks and let the mill pump water into them; this answers for either stacks or pits, and when it is desired to empty them the water can be easily allowed to run away, using a piece of hose as a syphon.

There is another advantage in having a pit, that is, the green fodder can be chaffed and by means of a traveller carried direct into the pit, and where coarse fodder such as maize, amber-cane, sugar-cane, etc., is used, this is a great improvement, for not only is the silage more easily taken out, but it loses much less than if the green stuff had not been chaffed, as in that case it would not have lain close together, and all the spaces would have been full of air, and there would probably be bad spots in it. In a properly constructed pit there is practically no loss, except, perhaps, a little on the

very top, and even that can be prevented by pulling a little straw over it and under the weights.

Stacks have this advantage—they can be built anywhere that is most convenient for feeding the cattle, and require no expense to speak of in their preparation. It must be remembered, however, that in all stacks there is more waste all round, unless protected by straw or some other material on the top also.

Stacks should be built wide and high, for after a few days the green stuff shrinks greatly, and a stack 10ft. high the day it is built may only be five a few days after. Where water is not available a very simple and effective means of securing pressure is to get good strong saplings about 4ft. wider than the stack. Two can be used every 5ft. along the stack, one above and one below, put down before the stack is built, the ends of the saplings extended 2ft. on either side beyond the stack; on the upper sapling a stout rope is fixed on either side, two or three feet longer than the stack is to be high. When it is required to press the stack a double block and pulley is used, and the upper sapling is hauled down by means of the block and pulley as near the lower one as possible, and then made fast by the rope already attached to it. The best way to do it is to start at one side of the stack, and with the rope attached to the upper sapling haul one end down and then make fast, then on the other side fix the block and pulley and haul down until the sapling is level. Haul the next one down first on the opposite side to the first one, and by thus alternating them the stack can be kept plumb.

It is not necessary to either fill a pit or complete a stack right off; they can be added to almost any time, and, if thoroughly trodden on at first, will take no harm for several days without pressure. Both pits and stacks should be made deep, as by that means a considerable amount of pressure is obtained from the weight of the material alone.

Every dairy farmer ought to always have a considerable quantity of silage on hand; if not needed one season it will keep over until the next, or for a good many seasons; and should a dry year come there is always a stand-by for the cows or any other stock that may require it. Sheep, pigs, and horses will all eat it and do well.

The making of silage is quite independent of the weather, it can be made in wet weather as well as in dry; thus crops can be grown and utilised for silage at any time of the year. The expense attached to making it is small, while the feeding value is very great.

The crops suitable for ensilage are many, and can be grown to suit all climates; thus, grasses, clover, tares, peas, beans, lucerne, trefoil, oats, wheat, barley, rye, and all the sorghum tribe, and maize. Silage can be fed entirely to cattle from 50 to 70lbs. per day, according to size, and they will thrive on it; or it may be given as a ration with any other kind of food.

Cattle will nearly always eat sweet ensilage right off, but sometimes they refuse the sour silage for some days, but eat it greedily enough after.

Fair average silage weighs about 48 to 50 pounds to the cubic foot, and for either summer or winter feed no dairy farm should be without a good supply of silage.

Milk and Cream.

In order to realise the proper manipulation and methods of dealing with milk either for butter-making, cheese-making, or retailing, it is necessary to understand its composition, its characteristics, and peculiarities.

Milk is composed of a number of substances held in solution or suspension in water. The proportions of these vary greatly in different animals, and even in individuals of the same breed a considerable amount of variation is found, more especially in the percentage of butter fat. The chief constituents of cow's milk are: water, varying from 82 to 88 per cent.; butter fat, from 1·7 to 6·6 per cent.; casein, from 2·8 to 5·5 per cent.; albumen, from ·38 to ·60 per cent.; milk sugar, 2·9 to 5·25 per cent.; mineral substances, 6 to 9 per cent. These are about the outside limits of variation, but the following may be taken as a fair average composition of ordinary milk:—

	Per cent.
Water	87·60
Fat	3·25
Albumen	0·45
Casein	3·40
Sugar	4·55
Ash or mineral substances	0·75
	100·00

Milk when drawn from the udder of a cow, if she be quite healthy, is free from germs of any kind, and if put into a vessel thoroughly sterilised, without being allowed to be contaminated with any of the germs that are constantly floating in the air, or that are continually falling from the body of the cow, will keep for months or even years in a perfectly sweet condition, and will not turn sour; but, unless the most extraordinary precautions are taken, it is almost impossible to obtain the milk germ-free, and, commercially, it is impracticable.

In diseased animals germs of the particular disease by which they are infected pass through with the milk, and may thus cause disease in the systems of those who drink the milk. This is especially the case in tuberculosis, which is readily conveyed from an affected cow to the human system; in fact, it has been pointed out by many scientists, who have made this matter a careful study, that this dreaded disease is rarely ever found among those who do not use cow's milk or flesh in any form, whilst among those who do use the milk or flesh, the proportion of humanity suffering with tuberculosis increases almost in the same ratio as the quantity per head per annum used. Hence the great and urgent necessity of having all dairy and butchers' stock under regular, constant, and capable inspection. Not only should the stock be inspected at regular intervals, but all the surroundings where stock are kept should be constantly inspected, and in any place where proper precautions are not taken no milk should be allowed to be used for human consumption; and not only should the stock and the premises be under constant supervision, but the persons who milk the cows should be inspected also to see that they are not suffering from any skin or other infectious disease, and severe punishment should in all cases be meted out to any person milking or having anything to do with the preparing of the milk suffering from any disease. Milk is at the same time one of the most useful and also one of the most dangerous articles of human food, and it is the duty of the State to see that its people are protected from the ignorance and carelessness of those who sell milk or its products in any form.

The most common sources of infection are:—Keeping or milking animals in close, ill-ventilated sheds where the atmosphere becomes fairly saturated with germs of all kinds, good and bad, the latter often greatly outnumbering the former.

Dirty cow-yards, where manure is allowed to accumulate, and where the drainage is deficient or non-existent, compelling cows to feed on unhealthy

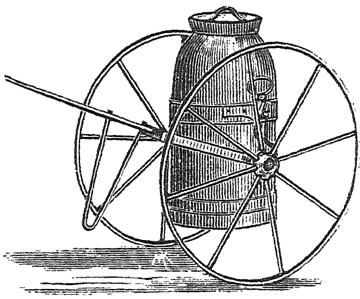


FIG. 1.—A convenient method of carrying the milk from the milking shed to the dairy where a large number of cows are milked.

pastures, or allowing them to drink impure water, are all sources of infection. How can pure milk be obtained from cattle allowed to wander about the suburbs drinking stagnant drainage water and eating all kinds of refuse?

Milk should never be kept, after it has been drawn from the cow, in the cow-shed or milking yard, or in rooms not properly constructed, or in badly-ventilated dwelling-houses; or in places opening off the dwelling-rooms. The sources of infection are from germs or bacteria, but in addition to these many extraneous substances are found in milk for which there is no excuse, such as manure particles, fungoid growths, cow hair, human hair, particles

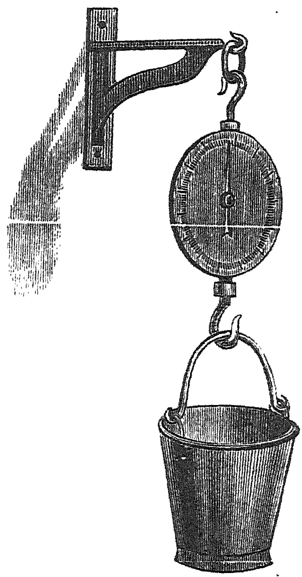


FIG 2.—Apparatus for weighing milk immediately after milking.

of skin (cattle and human), insects, threads of various kinds, earthy matter, etc. These are often the result of improper straining, not cleaning the cattle, or washing their udders or teats when they are dirty before milking. All this want of care, attention, and cleanliness is not only injurious to the

consumer, but tells heavily against the suppliers, as milk in a condition like this will not keep half the time that it would if it were properly looked after. Neither will the butter or cheese have as good a flavour or bring nearly as good a price; so that, outside all reasons of health, the pocket alone should make people more careful in all things pertaining to dairy matters.

When the milk is just fresh from the cow, it has a considerable amount of animal flavour in it, and if kept without being thoroughly exposed to the air, this flavour remains, and its presence deteriorates the quality of the butter and cheese made from it, while the milk itself has an unpleasant taste, and rapidly goes sour. In order to do away with this the new milk should be thoroughly exposed to the air and, if possible, cooled. This can be done most effectually by means of a Lawrence cooler (Fig. 3).

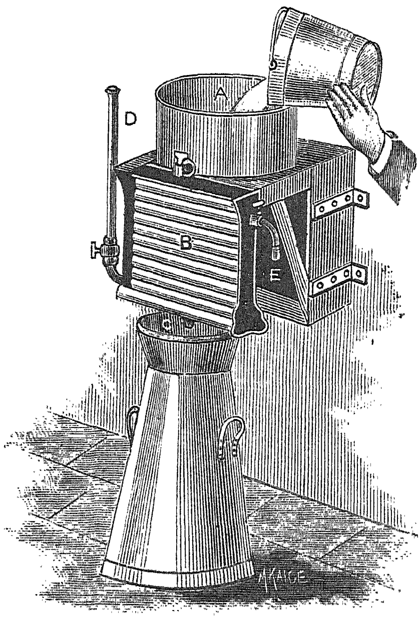


FIG. 3.—A is a vat into which the milk or cream is poured and runs out from a wide-mouthed tap into a V-shaped trough, which is perforated with holes so that the milk or cream can escape over both sides of the cooler. B is a corrugated copper cooler, thoroughly tinned all over, and hollow inside, over which the milk or cream slowly falls. C is where the milk or cream escapes into the can. D is where cold water is allowed to flow into the cooler, and rising up in it overflows at the outlet E. The cooler can be swung under the cream spout of the separator and thus save the trouble of lifting and carrying.

By this contrivance a stream of cold water is constantly passing through two corrugated sheets of copper, tinned on the outside, over which the milk is allowed to run in a very thin layer. Milk thus treated will keep nearly as long again as milk not so treated, and all animal odour is removed. Where this appliance is not procurable, the milk can be greatly improved by means of passing a current of fresh air through it.

The specific gravity of ordinary milk is given at 1·031, which means that a vessel holding, say, 1,000 pounds of water, if filled up with the same quantity of milk, would weigh 31 pounds more. But the various constituents of milk, if separated, differ greatly in their specific gravity; thus the fat is lighter than either milk or water, having only a specific gravity of ·930, and

thus it is that the fatty portion, or cream, rises to the surface when the milk is allowed to remain quiet. The fat in milk is in small globules, and they vary greatly in size in different breeds and individual cows. The size of

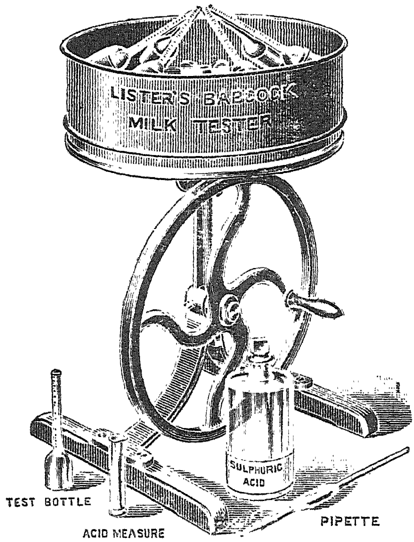


FIG. 4.—Lister-Babcock Milk Tester.

these globules varies from $\frac{1}{1500}$ part of an inch in diameter to $\frac{1}{25000}$ and it is this variation in size that makes the cream from some cows' milk rise so much more quickly than the cream from others. The larger the globules are the more quickly they rise to the surface; while the smaller, the slower they rise. This also explains why it is that in the hot weather we cannot get so much cream from the milk by the ordinary setting system as in winter, for in summer the milk rapidly sours and thickens, which stops the upward progress of the fat globules, but in winter the milk keeps sweet and fluid much longer, when most of the globules are apt to reach the surface.

FIG. 5.—Lister-Babcock Milk Tester.

This is one of the advantages of the cream separator, that all the cream is obtained from the milk independently of the weather.

Milk in which the fat globules are very large, or in which the cream rises very rapidly, is more suited for butter-making than for cheese. If used for cheese-making the cream rises so rapidly that in setting the milk

much of it rises to the surface and is not incorporated in the curd, but is lost in the whey. The milk with the small fat globules rising slowly has not time to reach the surface before coagulation takes place, and the globules are well incorporated throughout the curd.

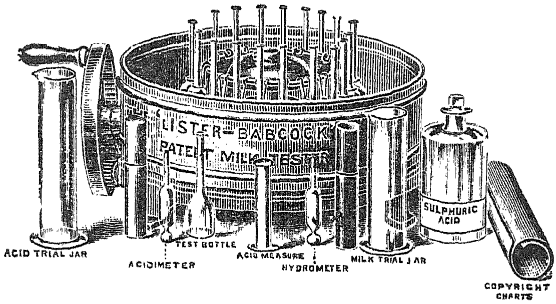


Fig. 6.—Lister-Babcock Testing Outfit.

We have spoken of the milking-sheds, the yards, cooling and testing of milk, now we will follow the course of the milk from the time that it is drawn from the cow until it is made into butter.

We will suppose the cow has been brought into the milking bail and is ready for milking. Having been properly secured, the udder and teats should be carefully washed and dried. Before milking each cow the milker should wash his or her hands. The milker should sit in close to the cow, and it will be well for the proprietor or manager to see that the milker's finger nails are not allowed to be long, for this is a very common source of giving cows sore teats, the nails cutting the teats during milking. To milk properly and in a cleanly manner, the teats ought not to be wet, but the milking done dry. Many persons who have been milking all their lives will object to this and say that a cow cannot be properly milked unless the teats are kept constantly damp with milk. This is a great mistake, and although when tried for the first time it may feel a little awkward, after a short time it will be found easier than the other way. The wet method is a filthy one, and, where the udder and teats have not been washed, great drops of dirty milk may frequently be seen dropping into the milking bucket and leaving a dirty stain on it, while the milker's hands are covered with dirt. Such treatment as this serves to spoil the flavour of the butter and induces bad fermentations which make the butter rapidly lose its keeping properties.

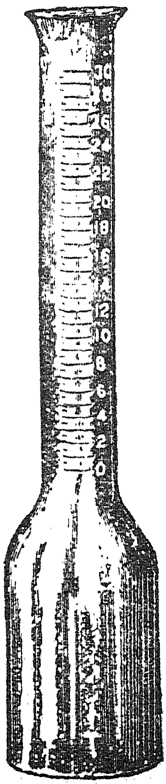


Fig. 7—Babcock Testing Bottle.

The milk immediately after milking is taken to the cream separator, and the cream as it comes from the cream spout is run over a cooler and then into cans, while the warm new skim milk is fed to the calves. When the separating is over, the cream is taken to the dairy which, in the summer time, is kept as cool as possible, while in the winter, if the weather is very cold, it may require to be heated. The cans containing the cream are left uncovered, unless it may be with muslin to keep flies and other insects out. The cream should be stirred up with a wooden ladle at least three times a day, so that it may all mature evenly. If not stirred, a hard cream forms on the top, and this sometimes will not break up in the churning, and thus leaving lumps of cream in the butter, which will spoil its appearance and prevent its keeping.

In hot weather, if the cream is not cooled and put into a perfectly sweet vessel, a rapid fermentation will sometimes occur, and the cream swell up to several times its original bulk. When such a change as this occurs it is a very difficult matter afterwards to churn it, and the resultant butter will be of very little value. Where the number of cows warrant it, cream of the same age should only be churned, as the result is more satisfactory; but of course in small dairies this cannot be done, so particular care should be taken to have all the cream at the same stage of ripeness On no account

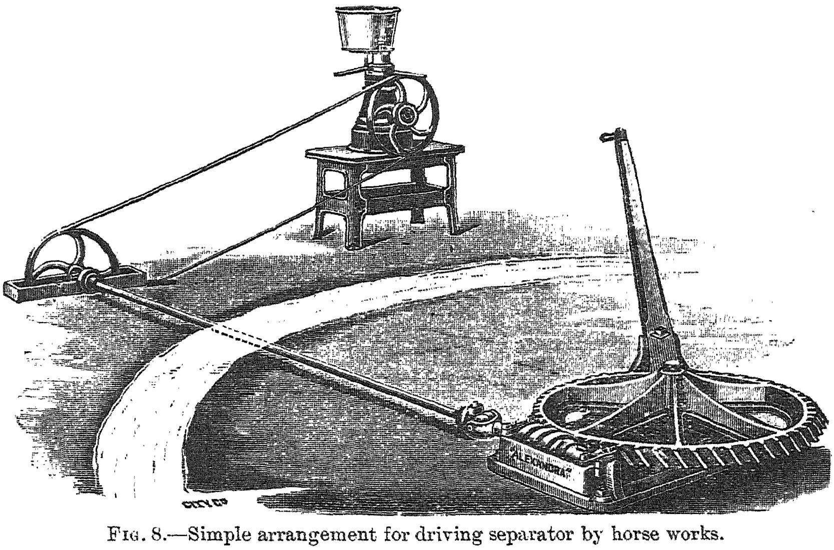


FIG. 8.—Simple arrangement for driving separator by horse works.

should fresh cream be mixed with matured cream just before churning. If it is desired to churn the cream of a late milking it should be mixed with the matured cream at least 12 hours previously and thoroughly stirred several times. If fresh cream is mixed with matured or ripened cream and churned at once we have the following result:—If the churning is stopped immediately the butter breaks, as it should be, there will be a great loss of butter in the butter-milk, as it takes longer to churn fresh cream than ripened; or if the churning is continued until all the butter has come, that of the matured cream will lose in quality and become greasy through over churning. In either case there is a waste.

The word ripened, or matured, has been used several times, and what is meant by the term is that the cream has undergone a certain amount of fermentation and become slightly sour, after which we get butter with a better flavour, better keeping quality, and more of it.

Some persons prefer what is called sweet-cream butter; that is, butter made from fresh cream when perfectly sweet. To some this kind of butter seems perfection, but to most it is devoid of flavour, and even were it equal to that made from ripened cream, it does not keep sweet for more than a day or two. From the dairyman's point of view, it is not at all profitable, as there is a very serious loss of butter in the butter-milk, often as much as seven or eight per cent., and this alone would prevent this process being followed if it were more generally known, but it is rare that a dairyman ever tests his buttermilk to see whether there be any loss or not.

Another disadvantage is that the fresh cream is hard to churn in warm weather, often taking hours and sometimes swelling up, the butter not coming at all unless a quantity of the cream be taken out of the churn and cold water added. Before the cream is put into the churn its consistency should be examined, and if on the thick side, water should be used to thin it down, as it is better to err on the side of having the cream too thin than too thick. With very thick cream there is nearly always a considerable loss in the buttermilk. The thicker the cream, as a rule, the greater the loss. Cream that gives about 45 per cent. its weight of butter is about correct, and less likely to be over-churned or leave any loss than when it is either thicker or thinner. I have not infrequently known cream to vary from 30 per cent. to 90 per cent. of butter; in the latter case it was almost a solid mass and had to be worked through a sieve and mixed with a great quantity of water to get it to churn at all, and even then the butter was not good. This cream was obtained from a separator that was driven at a speed almost double the average rate, through a wrong sized driving pulley having been put on the shaft. It was fortunate that no serious accident occurred. Where no separator is employed and the whole method of setting milk in dishes is used, the cream is more likely to be on the thick side, especially if the milk is scalded. Where it is desired to scald the milk, the temperature should never be raised above 180 degrees—from 170 to 180 degrees is a good temperature, and in the hot weather better results will be obtained from scalded milk than that set naturally. After the milk is heated up to, say, 170 degrees, it should then be cooled as rapidly as possible. If a fair supply of water is available the dishes may be set in a trough made for the purpose, and a constant stream of water allowed to flow around them.

By scalding in summer more butter may be obtained from the milk than by ordinary setting; as the milk will keep sweet longer and thus give the cream more time to rise. In warm weather, if the milk is set immediately after milking, it will sometimes go thick in 12 or 15 hours, and when that occurs the cream globules cannot force their way through the thickened milk to the surface, and thus so much cream is lost, or, at least, the butter returns are short, and the calves or pigs get the benefit of it. It is a rather suspicious sign, if no other feed is given, to see calves keep very fat, and a close examination into the method of skimming might disclose where a heavy loss takes place. It will not pay a butter farmer to fatten calves at the expense of the churn.

Having seen that the cream is of the right thickness for churning, the next thing to do is to see that the temperature is correct. If this is looked

after it will save many a weary hour's work in turning the churn. Always use the thermometer, and never depend on the feel or touch to gauge the temperature. To show how deceptive the touch is, anyone can try an experiment for themselves. Have some water at 60 degrees and cool the hand by putting it into very cold water for a little time, then put it into the water at 60 degrees. The water will feel quite warm. Now put the hand into warm water and let it get thoroughly heated and put it back into the water at 60 degrees and it will feel quite cold. Thus the temperature to the touch will depend altogether upon the state of the hand at the time of trial. As a general rule, the proper temperature to churn at is about 58 to 60 degrees, but a certain allowance can be made according to the outside temperature. Thus, if the weather is very cold, it will not do any harm if the temperature goes up to 62 or 63 degrees, or, if very hot, down to 55 or 56 degrees. If allowed to go lower, the time of churning will probably be greatly prolonged, or if higher, the butter may come too quickly and be soft and greasy, or it may not come at all.

Churns.

Of churns and churn-making one might truly say there is no end. New churns, for which all kinds of advantages are claimed, from making butter in the space of a few seconds to that of extracting from 25 to 50 per cent. more butter from the cream than any other variety, are being continually put on the market.

The operation of churning consists of separating the fat globules from the milk, and to so separate them that they are not broken is the whole art of churning. Rapidity in churning, although it may save labour, frequently results in the breaking of the fat globules, thus causing a greasy butter. It must be remembered that the ability of a churn depends greatly on the temperature and ripeness of the cream at the time of churning, and no churn has yet been made that will give satisfactory results at all times unless these important conditions are attended to. So far as is known, the earliest form of churn consisted of skins of animals, into which the whole milk was placed, and these were hung on the back of a camel or ass, which was kept at a trot until the process of churning was completed. Since that time churns, fearfully and wonderfully made, have been put before the public, many of them at enormous cost, but of late years it has been proved that the principle of the old skin churn, viz., concussion, is in reality the correct one.

There is no doubt that good results are obtained from many different varieties, but if quality of butter and quantity, together with good keeping properties, are wanted in a changeable climate like that of Australia, so far the best results have been obtained from the concussion churns. These vary greatly in shape and method of working, still the principle involved is the same in all. Until within late years in many places the whole milk was churned, and in large dairies this involved churning every day, and sometimes several times daily. The churning was generally done by hand power, and not till within comparatively recent years was horse or steam power applied.

The most common form of churn was the "barrel," not such as we understand the barrel churn of the present day, but a conical structure that stood upright, narrowing into a neck to clasp the lid, and then widening out again. A wooden splasher in the form of a cross had a pole inserted

into the centre of it, and this pole stood about two feet above the top of the churn, coming through a hole in the lid. When churning commenced this pole or handle was moved up and down, the splasher attached to it moving through the milk, and if the churning was accomplished in an hour and a-half or two hours, the dairyman or maid was quite satisfied. It was hard work and slow, but the butter thus obtained, if the milk was properly ripened, was of good keeping quality. After a time it was seen that to swing the barrel horizontally, and have a moveable beater in the churn would save labour, and this was the next form. Then someone thought it would be better to have the churn revolving and fixed beaters inside, and for a long time this form of churn was very popular, but there was always one very great objection to it—the difficulty in cleaning—and the impossibility of being able to see if the churn was properly clean through the necessarily small opening in the side.

The next step was back to the churn in vertical position, but instead of the old splasher, beaters were put in that were attached to cog-wheels, so that they could be turned with a crank handle, or have a pulley attached and be driven by horse power. From this time forward the shape of the churn began to change to oblong square, round at the bottom and square at the

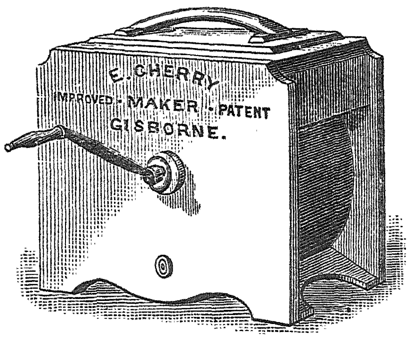


FIG. 9.—Cherry's Churn.

top, and many forms of beaters were used; some so fixed as to be revolving in opposite directions at the same time were once fashionable, as they churned quickly, but the results were not satisfactory, some of the butter being invariably over-churned and its keeping qualities spoilt.

At the present time the churn most used in small dairies is that shown in figure 9, and is known throughout Australia as the Cherry churn. It is a beater churn, which is a point against it, but in all others it has much to recommend it, being well-made, easily cleaned, and well ventilated all through the churning process. It is made in many sizes, but where a large machine is required a concussion churn would give better results, both as to the quantity and quality of butter obtained.

Of late years very few, if any persons, churn the whole milk, the cream only being used, and this requires, comparatively speaking, very small churns, and the labour is thus reduced to a minimum.

The reason that concussion churns are not used for very small dairies is that the small churns of this kind are difficult to clean unless the whole top is made to open, and this adds greatly to the initial cost.

Another kind of churn used for small dairies is that shown in figure 10, the action is similar to the Cherry, but it is not quite so easy to clean, nor can it be inspected so as to make sure that it is properly washed.

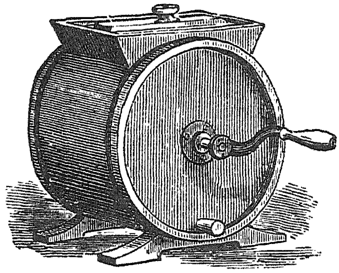


FIG 10.—Barrel Churn.

Figure 11 shows a concussion churn suitable for comparatively small dairies. It is a square box swung diagonally, the churn revolving, and it answers its purpose fairly well, but has the same objection as the former—its interior cannot be inspected thoroughly.

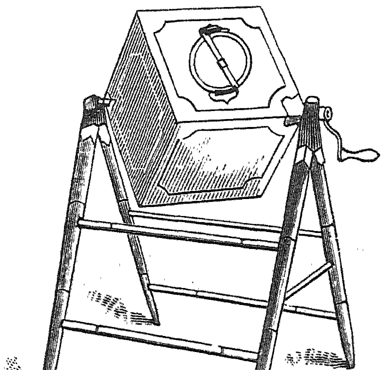


FIG. 11.—Rectangular Churn.

Figure 12 is another square box churn, and differs from the last in that it is swung from the centre at both ends. It gives good results in every way, but no churn is perfect that cannot be thoroughly inspected, and with the lid made in this fashion, this is impossible.

For large dairies and factory purposes the concussion churns were first made in the form of Figure 13, but owing to the difficulty of keeping them clean that form was changed, and that of Figure 14 has been almost universally adopted. Here it will be seen that the whole top of the churn lifts off, and every part of the churn can be thoroughly cleaned, and the butter obtained from this class of churn is as nearly perfect as butter can be.

There are many other kinds of concussion churns that give good results; thus, a barrel churn is made with spindles in either side at the centre of the

bulge, and the barrel revolves end over end, but there is often a difficulty, where the whole end comes out, of preventing a leakage, and when made of large size it is heavy to turn. Then there is the swing churn that is hung on four rods, and swings to and fro. In this, however, the churn is apt to be slow.

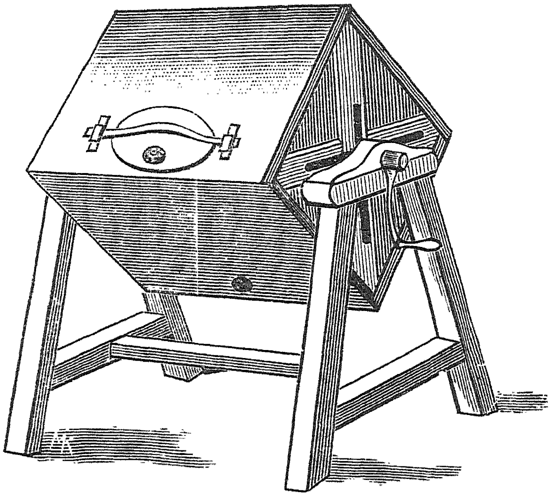


FIG. 12.—Square Box Churn.

One form of beater churn gives very good results, and this is known as the "Streamlet." Here the churn is divided into two compartments, the beaters being on one side. At the back of the beaters is a board perforated at the bottom for about six inches. When the beaters revolve the cream is kept going round in a constant current, and as the butter breaks it rises to the surface, and is prevented from getting to the beaters by the board, the unchurned cream and buttermilk being drained through the perforations, so

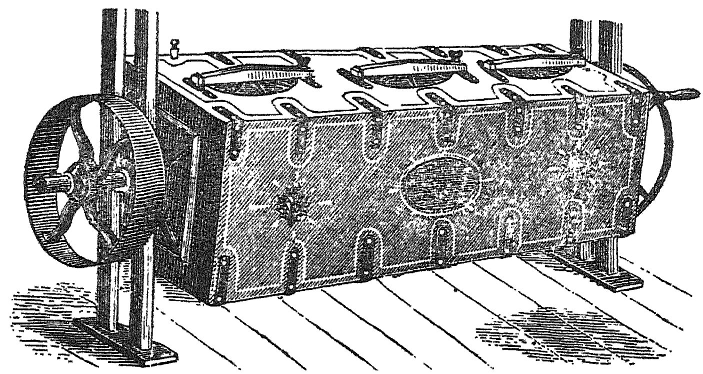


FIG. 13.—Revolving Box Churn.

that there is no chance of the butter being over-churned; where the buttermilk is used for sale or feeding purposes this churn does not answer well, as a large quantity of water has to be used so as to keep the cream thin enough

to flow; otherwise the results are good. Another form of churn that great results were looked from was a beater churn that was used, and is still, to a certain extent, in Denmark. It is barrel-shaped, set vertically, with a beater revolving in the centre. This beater is hollow, as is also the shaft driving it; all round the beater small holes are perforated, and by means of an air pump a constant current of air is sent through the cream. This was supposed to add greatly to the keeping properties of the butter, as all foul and noxious gases and vapours were expected to be carried off. The results, however, did not come up to expectations, and although the churns are still used in many places, the air attachment is not used with them.

Some years ago a churn was invented that performed the operation of churning by means of air only. The cream was put in a glass vessel with an opening at the top to let the surplus air out, and air was pumped in through a hole in the bottom. The process certainly in time produced butter, but a pint of cream swelled to such an extent that a gallon measure would not hold it. As showing what could be done it was a success, but as a practical utensil it was a failure.

There is one more method of obtaining butter that was written about a great deal some years ago, but which the writer has never tried nor seen tried. As a novelty it is mentioned. The cream is placed in a calico bag and buried about 10 or 12 inches deep in the earth and allowed to remain from 18 to 24 hours, and it is claimed at the end of that time that perfect butter will be the result. One man writing in the *Scientific American* some years ago claimed that he won a great many prizes for butter made in this way. The method is given for what it is worth.

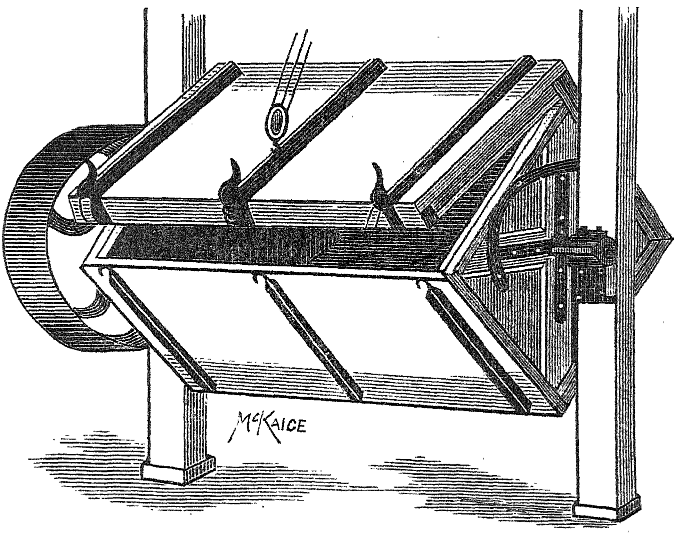


FIG. 14.—Factory Churn.

In all churns what is wanted is an instrument that will churn the cream equally—that some of the cream will not be churned some time before the rest. In beater churns this is the difficulty, the cream that comes into actual contact with the beaters often turning into butter a considerable time before

the cream that does not. The consequence is that if churning is stopped as soon as the cream breaks, a great deal of butter is lost in the buttermilk, while, on the other hand, if churning is continued until all the cream is thoroughly churned, the butter that came first gets over-churned, *i.e.*, the small sacs holding the fat globules are broken and the butter becomes greasy. When this latter is the case the butter loses its keeping properties. This anyone can verify for themselves by stopping churning as soon as the butter breaks and running off all the buttermilk, leaving only the butter behind. The buttermilk is then churned for some time longer and butter will be found in it.

A perfect churn will churn the cream evenly, provided all the cream is of the same degree of ripeness. If the buttermilk from the churn is analysed it will be found to be almost free from butter fat, only a trace being discovered (often as little as ·02 per cent.); while with badly-constructed churns it is not uncommon to find from 2 to 5 per cent. of butter fat in the buttermilk, and in this case the loss to the dairyman is very great, and in even a small-sized dairy will run into pounds in the course of a single season, and may make all the difference between a profit and a loss in the dairy accounts.

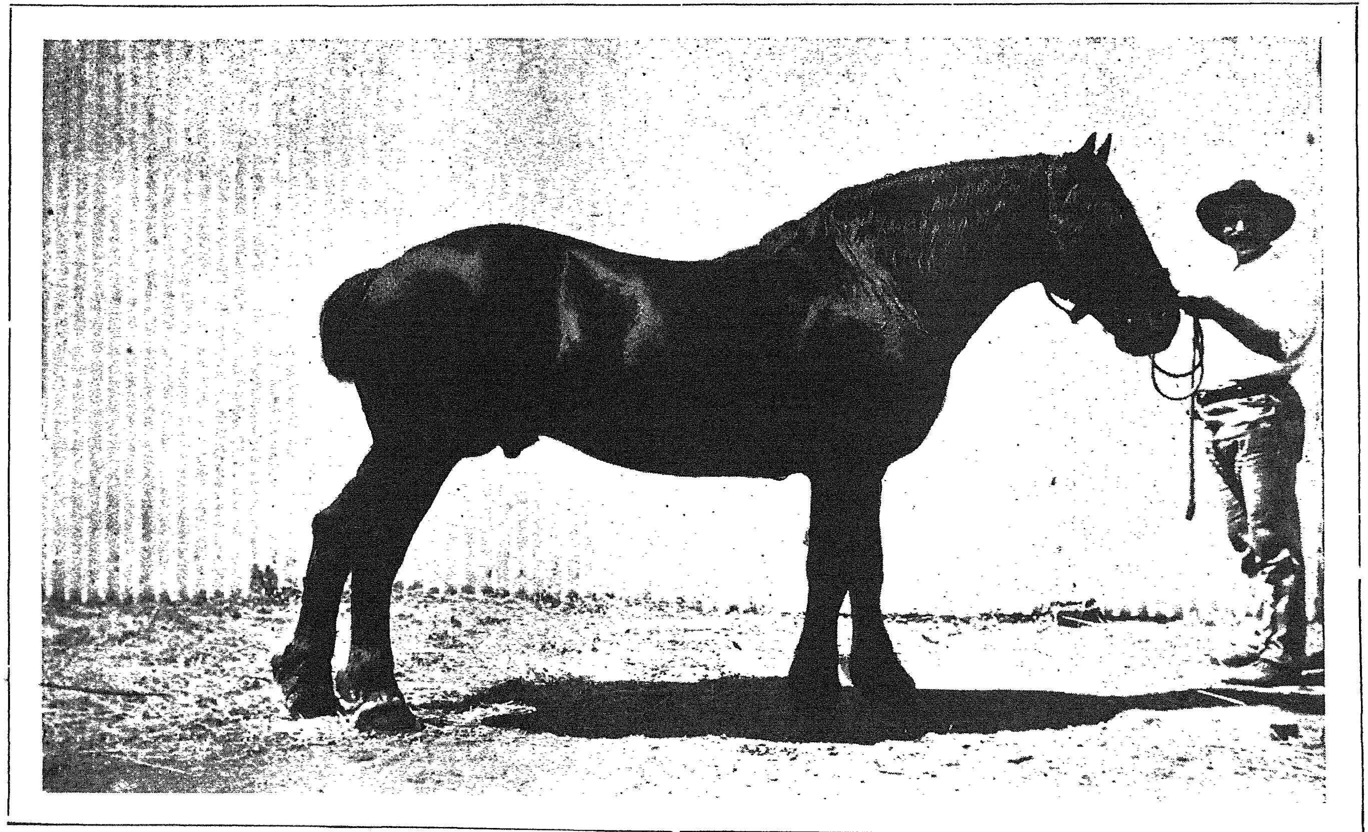
Many kinds of material have been tried for making churns, but none give such good results as wood. Oak is probably the best, but it is heavy and expensive, and in these States the best churns are made out of well-seasoned kauri pine, and these, if properly looked after, will last a lifetime or longer.

After churning, when washing the churn do not put boiling water into it first. If that is done it hardens the casein in the cracks and corners and makes it almost impossible to remove. Tepid water should first be used to thoroughly rinse the churn, and after that boiling water, quickly emptied out, and the churn allowed to dry. The churn should always be kept in as cool a place as possible, with plenty of fresh air about it, and left open so as to keep it sweet.

Butter-making.

The churn, before being used, should first be thoroughly washed with cold water. Boiling water should then be put in, and care taken to let it have access to every part of the churn. The hot water is then allowed to escape, and the churn thoroughly cooled down with cold water; by so doing the pores of the wood are contracted, and the sticking of the butter to the wood prevented. Some dairymen use brine for cooling the churn, and its use is advantageous if the churn is not made of first-class wood, or if it is very old. But with a new churn, made of well-seasoned wood, it is not necessary. If this practice is followed immediately after and before churning, there will never be any necessity for the use of soda or other chemicals. Of course, it is taken for granted that the churn has been properly made, and there are no crevices or cracks to allow the cream to lodge in; if such should be the case, there is only one remedy, and that is to *burn it*, for a little bad cream remaining in the cracks is sufficient to spoil every churning, and it is almost impossible to thoroughly cleanse such a churn.

The cream should be poured through a wire sieve into the churn, so that any lumps that may be in it can be broken up, and thus insure uniformity of churning. It is also useful in case any foreign matter may have dropped in.



Suffolk Stallion, "War Dance." Chapman Experimental Farm.

We now come to the question of colouring. In the winter and spring, if the cattle are on green feed, there will never be any necessity for artificial colouring; but when the pastures dry up the butter comes out a sickly white, then colouring is required, but care must be taken not to overdo it, as one extreme is quite as bad as the other. The usual way of colouring butter is to add some annatto prepared in oil, which mixes with and is thoroughly incorporated with the butter. As soon as the cream is put into the churn the required quantity of colouring is added, and churning started at once.

Damage is often done to the butter by churning too fast. When starting, the speed should be slow, and then gradually increased up to the usual rate, which, taken as an average, is about 45 turns a minute; then, just before the butter breaks, the speed should be reduced again. When churning is first started the cream gradually swells and compresses the air, and unless this is allowed to escape there is a danger of straining the churn. After a few turns, if there is an air-hole in the churn, it should be opened every now and again, so long as there is any air coming away. With many people there is a difficulty in knowing exactly when to stop churning, and consequently there is a danger of over-churning. If the churning is done by hand, as soon as the butter commences to break, the cream will sound watery and can be distinctly heard splashing in the churn; it will also be much easier to turn. The churn should now be opened at once, and if the grains of butter are as large as sago the churning has gone far enough, and care must be taken not to over-churn. Cold water is now added in the proportion of about one-sixth of the original quantity of cream, and the churn started again very slowly and only a few turns given. If the butter is very fine and the grains not larger than the head of a pin, the same proportion of cold water is added, but the churn is turned quickly a few times, and this brings the grains to about the proper size.

The reason for adding cold water is, that it hardens the globules and prevents them sticking together, and thus allows the butter-milk to get away more freely. It also thins the milk and allows the fine particles of butter to come to the surface quicker, and helps to clear them of any casein that might otherwise stick to them. Just before the butter comes, or when it is coming, the lid of the churn should be taken off, and the lid and slides, and wherever any cream is adhering, should be carefully washed down with cold water, otherwise the cream that remains unchurned may get into the butter and spoil its appearance by causing white specks in it. The butter-milk is now allowed to drain off, passing through a hair sieve to catch any particles that pass away in it. If a proper sieve cannot be easily obtained the butter-milk may be strained through a piece of muslin doubled. When all the milk has been allowed to run off, the churn should be half filled with cold water again and all adhering particles of butter to the sides or beaters of the churn carefully washed off. The churn should then be slowly rocked if it is a concussion churn, or if a beater, turn the beaters slowly so as to allow every particle of butter to come in contact with the water, then allow the water to escape. This should be continued so long as the water shows any sign of milkiness at all. Of course, during all this time the butter is supposed to be in a granular state, if it should have gone into lumps it cannot be properly washed in the churn. If the butter is in a correct condition it will readily separate one grain from another, and although it may appear in lumps in the churn after the water has been run off, as soon as fresh water is added the granules will all separate again and float on the water.

If the weather should be rather warm and a difficulty be found in getting the water cool, salt added to the water will help greatly in hardening the granules and getting rid of the butter-milk. The amount of water required and the number of changes will depend greatly on the quality and condition of the cream. If the cream is composed of globules that are large they will rapidly rise and wash freely, but if the globules are small they will wash slowly. As to the condition, if the cream has been well looked after, thoroughly stirred and allowed to ripen to a proper degree and churned at the correct temperature, it will wash freely, and about three changes of water will be sufficient. If, on the other hand, the cream has been rather fresh or overripe, or [the temperature too hot, it may take six or seven, or even more changes, but in all cases the butter-milk should be got rid of before the butter leaves the churn—if not, the probabilities are that it will subsequently be overworked and the grain spoiled. The correct amount of washing can always be gauged by the colour of the wash water as it comes away. If it is desired to brine salt the butter, it should be done before removing it from the churn. A strong solution of brine is made—there is no difficulty in making it the required strength, as more salt can be added to the water than will be dissolved—so if the salt and water are mixed an hour or two before being used and the mixture is well stirred occasionally, and it is found that some of the salt remains undisturbed in the bottom of the vessel, then a saturated solution is obtained, only the clear liquid must be poured off, and the residue can be used again. The brine is then poured into the churn and the butter allowed to float in it, being gently turned every few minutes for about half an hour. It will readily be seen that unless the butter is in a granular form the brine cannot get at all the particles, so if the butter has by any means got into lumps, it cannot be properly brine salted. After half an hour, the butter may be taken from the churn, being lifted with wooden pats, or, as they are sometimes called, "Scotch hands," and placed on the butter-worker loosely, it is then allowed to drain for 5 or 10 minutes, and then slowly worked so as to get all the surplus moisture out of it, and to consolidate it into one mass. When this has been done, it is ready for printing.

(To be continued.)

GARDEN NOTES FOR APRIL.

This month generally sees the breaking up of the long, dry period of the summer months, and good falls of rain may be expected. The ground being warm and the early rains being generally warm, all vegetation which has barely been keeping alive for the past few months quickly responds to the altered conditions, and, after being refreshed by these welcome rains, takes on a fresh, green appearance and makes rapid growth. Our experience teaches us that it is always the early sown plants that do best; and to have early vegetables of all winter kinds, the ground should be thoroughly prepared before the rain sets in, so that, directly the ground becomes moist, the

seeds can be planted, and while the ground is warm they will make rapid growth; if left until the ground becomes saturated with moisture and comparatively cold the growth will be much slower. The ground should be deeply worked by sub-soiling or trenching so as to allow the air and water to penetrate the soil, and due provision made for running off the excess water later on in the winter without having to disturb the growing plants when the ground becomes soft and perhaps boggy. Young plants, such as cabbages, cauliflowers, and even root crops, should be raised in boxes or sheltered beds so that they can be planted out on the first occasion. In planting out young seedlings, only strong healthy plants should be used, all weak and unhealthy looking plants should be discarded; it will be better to wait until a fresh supply can be raised than to put out weakly plants. It is frequently the case that plants are weak and misformed through being too thickly sown in the seed beds, each seedling not having sufficient room in which to develop, and to prevent this the young plants should be thinned out so that one plant does not interfere with another. It will be better to raise a smaller number of healthy strong plants than a large quantity of weak ones. With the advent of the first rains a bountiful crop of weeds will no doubt appear, and these should be cut down as soon as possible, the sooner they are hoed down the easier will be the work, as the roots very soon obtain a good hold of the ground. A Planet Junior machine, either of the horse or hand type, is the best for this work, and will enable one to cut out the weeds with a minimum amount of backache.

Asparagus.—Should be much more extensively cultivated than it is. It is planted very early in the spring. A good bed, trenched to a depth of 30 inches and thoroughly well mixed with well-rotted stable manure, should be prepared during the winter months so as to give the manure a chance to mix with the soil before the spring.

Beans (Broad).—Sow extensively of these as soon as possible. They prefer a fairly heavy soil, but do on a wide range of soils. Sow in rows about 3ft. to 4ft. apart and the seeds about 4in. apart in the rows.

Beet (Red and Silver).—Put out seeds in seed beds ready to plant out on the first opportunity, or the seed may be sown direct in the rows and thinned out as they come up.

Borecole or Kale.—Thousand Headed, Jersey Tree, or Curly, is well worth trying; it is a hardy plant, and supplies a large amount of green leaves, valuable for poultry and stock, and the curly kale especially is valuable as a vegetable. Plant and treat the same as cabbage.

Brussel Sprouts belong to the same tribe as the cabbage, and are well worth attention as a vegetable. It requires a rather cool climate, and should succeed in the Southern districts; the plants are better raised in seed beds, and treated the same as cabbages.

Cabbages and Cauliflowers.—Have a good supply of young plants available in the seed beds to put out on the first opportunity, and sow a supply for future use. Manure the soil well with stable manure when available, and plant out in rows 3ft. apart and 2ft. apart in the rows; as the plants make a good growth a little liquid sulphate of ammonia will help them along. Only plant out healthy plants and put the roots down straight.

Carrots.—Sow extensively in drills. Drills should be 3ft. apart; but two rows of carrots may be shown in each drill. Sow the seeds thinly, and thin out when plants are large enough.

Celery.—Sow some seed in seed bed and plant out any plants that are large enough. Thoroughly manure the ground before sowing, and hill up any plants that are well grown.

Leeks.—Sow a quantity of seed, and plant out any seedlings that are ready.

Lettuce.—Sow a quantity of seed, and plant out all the seedlings available.

Onions.—Sow a liberal supply of seed, either in seed beds or direct into beds, and thin out as soon as they come up. They require a well-worked, pliable, loamy soil, well manured with stable manure. The drills in the permanent beds should be about 16 inches apart and the plants four inches apart in the drills.

Parsnips.—Sow a few rows, the same as carrots, in deeply worked and well manured soil.

Peas.—Sow largely in rows 3ft. to 4ft. apart; when a few inches in height they will require staking. Light brushwood sticks are the best to use for this purpose.

Turnips.—Early sown turnips will require thinning. A few more white turnips and a crop of Swedes can be sown during this month. Keep the beds free from weeds.

Farm.—Wherever the ground is in good enough condition ploughing should be pushed on with as fast as possible, and with modern makes of disc ploughs ploughing can be carried out at all times of the year. Land that was fallowed early in the season will require to be harrowed or scarified before sowing. As much of this work as possible should be done before the rain sets in, as, owing to the short season, the land speedily becomes soft, and in many cases last season farmers were unable to complete their seeding operations. Directly sufficient rain has fallen the cereal crops should be sown as quickly as possible, and if all the ploughing, harrowing, etc., is left until this time settlers with only limited horse-power at their disposal find it impossible to get the sowing done in time. All wheat, oats, and barley should be pickled in a solution of bluestone and water, 1lb. of bluestone to five gallons of water, before sowing, as a preventative against smut. Smut is becoming very prevalent among the wheat crops, and this is mainly due to the seed-wheat being sown unpickled, or to the pickling being done in a very indifferent manner. Special attention should be given to the selection of wheat for seed purposes; it will always pay to get the best obtainable, and the extra price paid for first-class seed is money well spent. Inferior and pinched seed is dear at any price. Like produces like, good seed good crop, bad seed bad crop; other conditions being equal, the good seed pays for itself several times over.

LOCAL MARKETS' REPORTS.

W.A. GENERAL PRODUCE COMPANY'S REPORT.

Market report of the W.A. General Produce Company, 245 Murray-street, Perth, for the month ending Wednesday, 7th March, 1906:—

Business: During the past week previous activity well maintained; supplies for to medium values all around still fluctuating; detail particulars as follows:—Bacon in very good demand; values continue to firm. Hams: Well-known brands still very scarce; demand stronger than ever. Butter: Usual supplies; fair demand; values unaltered. Cheese: Fair supplies now to hand, mostly from Queensland; quality very satisfactory, with value likely to further firm. Eggs: Supplies of local slightly more than of late; values eased somewhat; fresh lots still in great demand. Potatoes: Locals diminishing; Tasmanians are replacing them; values on the whole still considered very high. Onions: Last-week values jumped up very high; later advices record material fall. Chaff: Supplies continue to be well regulated, and values likewise. Fruit: Large quantities arriving daily; apples and grapes much over requirements. Vegetables: Supplies diminishing, values accordingly, cabbage in particular ruling high. Poultry: Prime table lots in demand; hens and aged roosters very plentiful, values anyhow. Chickens: Over supply, not being sufficiently fleshy for requirements. Game, if fresh, very good demand.

Farm and Dairy Produce.—Bacon: Hutton's, 9½d. per lb.; others (Newnham & Barnes'), 8¼d. to 8½d. per lb. Hams: Hutton's, 1s. 1½d. per lb.; others, 9d. to 1s. per lb. Butter: Euroa, 1s. 1½d.; Millawa, 1s. 1d.; Benalla, 1s. 1d.; Hansen, 1s. 1d. Lard, in bladders, 7½d. per lb. Cheese: Loaf, 8⅝d. to 9d. per lb.; medium, 8d. to 8½d. Eggs: Suburban, fresh, 1s. 9d. to 2s. per doz.; country lots, 1s. 4d. to 1s. 9d. per doz. Potatoes: Local, new, £10 to £14; inferior, £6 10s. to £8; seed, 14s. cwt.; Tasmanian, £11 10s. to £13 10s. per ton. Onions, 8s. 6d. per cwt. Chaff: Prime, £4 12s. 6d. to £4 17s. 6d. per ton; medium, £3 12s. to £4 per ton. Bran, £1 5s. to £1 10s. per ton. Pollard, £5 5s. to £6 10s. per ton. Flour: Peerless, Premier, Thomas', Gillespie, and Eureka, £8 17s. 6d. per ton, quarters £9 2s. 6d. per ton. Oats: Algerian, 2s. 10d.; New Zealand, 3s. 10d. to 4s. per bushel. Wheat: Truck lots, 3s. to 3s. 7½d. per bushel. Oil cake, worth £9 10s. per ton.

Fruit.—Oranges, Italian, 18s. 6d. to 22s. 6d. per case. Lemons, Italian, 22s. to 25s. per case; very scarce. Passion fruit, worth 5s. to 7s. 6d. per case. Grapes, from 1s. to 5s. 6d. per case, according to quality and variety. Figs, 1s. to 2s. 6d. per case. Peaches, from 2s. 6d. to 12s. 6d. per case, according to quality, variety, and condition. Nectarines, 6s. to 13s. per case. Plums, from 6s. 6d. to 16s. per case. Apples: Dessert, from 5s. to 11s. 6d per case; cooking, from 2s. to 8s. per case. Pears: Bartlett, 5s. to 9s. 6d.; Bergamotte, 6s. 6d. to 10s. 6d.; Flemish Beauties, 5s. 6d. to 8s.; others, from 2s. to 4s. Quinces, 2s. 6d. to 3s. 6d. per case. Melons: Rock, 1s. 6d. to 4s. 6d. per dozen; water, 1s. to 3s. 6d. per dozen.

Vegetables.—Cabbage, 11s. to 16s. 6d. per cwt. Carrots, 1s. to 1s. 8d. per dozen bunches. Parsnips, 1s. to 1s. 9d. per dozen bunches. Turnips, white, 4d. to 1s. 6d. per dozen bunches. Beans, French, 1d. to 2d. per lb. Peas, green, 3d. to 4½d. per lb. Marrows, 1s. 6d. to 3s. 6d. per dozen. Pumpkins, 2s. 6d. to 6s. 6d. per cwt. Rhubarb, 1d. to 2¼d. per lb.

Salads and Herbs.—Lettuce, 9d. to 1s. 6d. per quarter bag. Spring onions, 3d. to 8d. per bundle. Beetroot, 6d. to 1s. 9d. per dozen bunches. Cucumbers, 9d. to 2s. per dozen. Tomatoes, 9d. to 5s. per case. Celery, 6d. to 2s. per dozen heads. Raddishes, 3d. to 6d. per dozen bunches. Thyme, marjorum, and sage, 1s. 6d. to 2s. per dozen bunches. Mint, 3d. to 4d. per bundle. Parsley, 3d. to 5d. per bundle.

Poultry (for killing).—Fowls: Prime, killing, fleshy, young roosters, 4s. 6d. to 6s. 6d. per pair; mixed sorts, from 3s. to 4s. 6d. per pair. Chickens, 1s. 9d. to 3s. 9d. per pair. Ducks, 2s. 6d. to 5s. per pair (plentiful). Geese, worth 8s. to 10s. per pair. Turkeys: Gobblers, 12s. 6d. to 20s. per pair; hens, 6s. to 9s. per pair. Game—Black duck, worth 3s. per pair. Teale, worth 2s. per pair. Bluewing, 2s. per pair. Mountain duck, 3s. 6d. per pair.

Carcase Meat.—Pork, medium weights, 5d. to 6d. per lb.

Sundries.—Corn sacks, secondhand, 4s. 1d. per dozen. Bran bags, secondhand, 3s. 3d. per dozen. Bonedust, £7 10s. per ton. Bonemeal, £8 per ton. Phosphate, £4 5s. per ton. Superphosphate, £5 10s. per ton. Guano, amonical, £4 10s. per ton. Kainit, £4 15s. per ton. Nurate superphosphate, £6 10s. per ton. Special vegetable manure, £7 per ton. Potato, onion, and other root crops manure, £7 10s. per ton. Thomas' phosphates (English grades), £4 5s. per ton. Nitro-superphosphate, £6 10s. per ton.

Messrs. H. J. WIGMORE & Co.'s REPORT.

H. J. Wigmore & Co., of Fremantle, Perth, Kalgoorlie, and Northam, report as follows in connection with their daily auction sales of chaff and grain at Perth and Fremantle railway yards during the month ended Thursday, 8th inst.:—

Chaff.—During the month ending to-day consignments of chaff to Perth for auction have been regular and on a liberal scale, an average of about 130 trucks per week having been maintained. The market naturally has weakened somewhat, and whereas we closed our last monthly report with prime green wheaten ruling at £4 15s. to £4 17s. 6d. per ton, absolutely best price obtainable at the present moment for this quality is £4 10s. The market, however, is still in an excellent position, as it must be remembered that prices are fully £1 per ton better now than were being obtained at the corresponding date last year. Cow chaff has not maintained it value, and is worth £3 10s. to £3 15s. in Perth as we write. Considerable quantities of oaten chaff have come to hand during this month, so much so that we doubt if there is very much of this quality left in the country, and farmers are to be congratulated on the prices secured, as oaten chaff is not in keen demand at the moment, and value may be quoted at 2s. 6d. per ton less than wheaten. Fremantle market, as usual, has been very erratic. Some days better prices have been obtained than in Perth, but on others, when, say, about 10 trucks have arrived, we have had to rail consignments back to Perth in order to get value. We do not, therefore, advise consignments to Fremantle, and this market can always be fed from Perth when necessary. With regard to imported chaff, very little if any is arriving, but we hear authentically of a purchase of 1,000 tons of South Australian chaff, spread delivery 1906, although we have not yet ascertained particulars as to name of buyers, price, etc. The position is clear. Should the market rise here to any considerable extent, it simply means that Eastern chaff on present conditions will be landed. This position we have taken up for many weeks past, and it is noticeable that several speculators in chaff who bought heavily in December and even in early January, have now altered their holding tactics and are getting out of their purchases, we doubt if at a profit on present market. With the very heavy hay crop in Victoria, which amounts to something over 650,000 tons, there can hardly be much rise in the Eastern States, and in the event of South Australia being unable to supply, Victoria will be in a position to do so at low prices. This being so, Victorian chaff is of course available for export directly the associated steamers are prepared to carry same at reduced rates, and we anticipate that this will be as soon as South Australia ceases to export to Western Australia. Altogether, we do not see how prices can improve materially, for some months to come at least, and our advice to farmers is to quietly but consistently forward their chaff along to market. We quote closing values as follow:—Prime green wheaten, £4 10s. (on a bare yarding possibly an extra 2s. 6d. could be obtained); f.a.q. wheaten, £4 7s. 6d. to £4 10s.; good medium wheaten, £4 5s.; prime oaten, £4 10s.; medium oaten, £4 5s.; cow chaff and inferior grades from £3 15s. upwards.

Wheat.—This commodity is in exactly the same position as when we last reported to this journal, and 3s. 7d. for prime milling is with difficulty obtained at auction in Perth. We are in a position, however, to place several thousand bags prime milling at this figure, and invite correspondence from farmers and others holding. We secured privately up to 3s. 7d. last week for wheat slightly smutty, and could probably repeat sales of this description at the same money. The smut balls, however, must be intact. Smutty wheat, with the smut balls broken, and the wheat necessarily smelling badly, is not worth more than 3s. 3d. to 3s. 4d.

Flour.—We have our usual steady spot sales of Adelaide and Northam "Standard" to report, prices being on rails Northam, £8 2s. 6d. sacks, £8 7s. 6¼d., f.o.b. Port Adelaide £7 10s. sacks, £7 15s. 0¼d. We have also sold heavily of Northam "Standard" for forward contracts, delivery as required throughout 1906, and recommend bakers desiring to make contracts to communicate with us at once.

Oats.—The position of Algerian Oats has been somewhat peculiar during the month. Much activity has been evident in the Eastern States, and Good Heavies went up as high as 2s. 4d. in store, and our information from Melbourne at the time was to the effect that 2s. 6d. market was imminent. The effect of the recent rains, however, has been to ease the market considerably, and business has been done during this week at 2s. 1d. up to 2s. 2d. f.o.b. This year's harvest in Victoria, however, is between six and 7,000,000 bushels or nearly 50 per cent. short of last season's returns, and this shortage must make itself felt later, and we are looking forward to an early return to former prices. The excited state of the Melbourne market has not affected prices on spot, and it has been quite possible to purchase at 2s. 5d. during practically the whole of this month.

Bran and Pollard.—On spot Bran is worth £5 5s. up to £5 10s. free on rails Fremantle, Pollard £5 7s. 6d. to £5 12s. 6d. Bran has eased in Sydney, and our latest wire from that centre quotes 9¼d. f.o.b., Pollard same price. At the moment Sydney is the cheapest Offal market, and this easing of the market is no doubt due to the recent heavy rains experienced through the Eastern States.

KALGOORLIE CHAFF MARKET.

Consignments to this centre have been plentiful during the last week or two, and best price now obtainable for Prime Green Wheaten may be stated at £5 5s. Lower qualities are impossible to sell at reasonable rates, and we do not advise farmers to consign anything but very best quality of prime green chaff to Kalgoorlie.

THE CLIMATE OF WESTERN AUSTRALIA DURING FEBRUARY, 1906.

This month, judged by the maximum daily temperatures, was the coolest February ever experienced in Perth since records started in 1876. The mean maximum at the Observatory was 80·5, and the temperature did not once reach 90°, a circumstance which has never been known to occur before.

This exceptionally cool weather extended along the West coastal districts from about Carnarvon (lat. 24″ 42′) to Bunbury, but thence again southward it commenced to assume more normal proportions, until at Cape Leeuwin the mean was slightly in excess of that for previous years.

It will, therefore, be seen that the welcome coolness extended over only a very small portion of the State; all other portions the heat was excessive. At Kalgoorlie the mean maximum was 94·8, being 14° above that for the Perth Observatory, and the highest, with one exception, that has yet been registered in February.

When the means of the daily maximum temperature are plotted on a map, it is seen that the 90° line includes the entire State, with the exception of a narrow strip of coastline between the North-West Cape and Eucla; and the 100° line includes more than half the State, the highest mean being 109·1 at Nullagine. The absolute maximum was 116·0 Marble Bar. The

general feature of the daily weather maps throughout the month was the passage of a succession of moderate "lows" across from the North-West coast through the interior towards South Australia, each one causing great heat and scattered thunderstorms. In fact, if the climate of Australia as a whole were studied, last month would probably be characterised as an exceptionally hot one throughout; for the heat waves, after traversing our interior districts, always travelled to the Eastern States, where they were severely felt. We have not yet, unfortunately, received the usual monthly statistics for Melbourne, but the mean max. at Adelaide was 92·0°, being 5·8° in excess of the average at that place for previous years, and 11·50 in excess of the mean at the Perth Observatory.

It may, perhaps, at first sight appear remarkable that the weather should be so unusually cool on the West coast and so abnormally hot on the Coolgardie fields and throughout such a large portion of Australia. As a matter of fact, however, the two are probably diverse effects of the same cause. Great heat is generally associated with the passage of a "low," and during last February the main track of these "lows" lay well to the North or East of Perth. We were, therefore, on the cool side of them, as the wind tends always to move towards their centres, and this means a cool breeze from the ocean all along the West coast; whereas the inland places receive the full benefit of the passage of the hot centre at close quarters.

If, however, the storm track had been a little farther West, and the "lows" had come down the Indian Ocean, just outside the West coast, instead of well inside, our winds would come in towards the centre from the East and North-East, and we in Perth would experience a heat wave. Moreover, the effect on the Goldfields would not be nearly so marked. There would, in fact, then be a tendency to a more uniformly hot temperature throughout, and we should suffer whilst the Goldfields were benefited. This type of weather is now (March 7) being well exemplified. A "low" is evidently passing down the Indian Ocean in a South-Easterly direction towards our South-West coast. Perth has therefore been experiencing a severe heat wave, with record temperature for March, whilst the Goldfields have been enjoying comparatively mild weather throughout the same period. Frequent thunderstorms occurred on the Goldfields during the middle of the month, rain being moderate to heavy between the 14th and 21st, and on the latter date it became fairly general throughout the Southern portion of the State, after which a well-marked "high" came along and brought some settled conditions. On the whole, the fall for the month was considerably in excess of the average for previous years throughout the Coolgardie fields and extreme South coastal districts. Elsewhere it was lighter than usual. No severe storms have been experienced yet this season in the tropics, and the rainfall has been, on the whole, considerably below the average for previous years.

W. E. COOK,
Per A.H.P.,
Government Astronomer.

The Observatory,
Perth, 7th March, 1906.

The Climate of Western Australia during February, 1906.

	Locality.	Barometer (corrected and reduced to sea-level). Mean of 9 a.m. and 3 p.m.	Average for previous years.	Highest for Month.	Lowest for Month.	Shade Temperatures. February, 1906. Mean Max.	Mean Min.	Mean of Month.	Highest Max.	Lowest Min.	* Average for previous Years. Mean Max.	Mean Min.	Highest ever recorded.	Lowest ever recorded.	Rainfall. Points (100 to inch) in Month.	Wet Days.	Total Points since Jan. 1.
North-West and North Coast:	Wyndham	29·780	29·792	29·954	29·569	99·7	80·2	90·0	108·0	69·9	96·0	79·4	106·0	64·0	431	11	1,072
	Derby	29·814	29·806	29·968	29·630	98·2	78·7	88·4	102·2	72·2	94·7	77·4	104·5	70·0	369	8	966
	Broome	29·822	29·794	29·975	29·626	93·0	78·4	85·7	96·4	70·5	91·6	78·4	101·5	70·3	410	7	945
	Condon	29·801	29·788	29·938	29·622	94·3	78·4	86·4	102·0	74·5	93·8	77·3	113·0	69·8	110	3	220
	Cossack	29·788	29·776	29·941	29·625	100.1	79·1	89·6	113·5	73·0	97·3	78·5	112·2	61·8	95	1	105
	Onslow	29·808	29·784	29·970	29·610	101·0	75·0	88·0	111·0	70·0	96·7	75·7	115·5	66·0	*Nil*	...	90
	Winning Pool ...	29·800	...	29·970	29·605	104·7	71·6	88·2	113·0	65·6	...	...	...	...	19	2	63
	Carnarvon	29·906	29·849	...	29·717	82·8	69·7	76·2	91·2	64·0	88·5	71·6	111·2	63·8	*Nil*	...	30
	Hamelin Pool... ...	29·884	29·829	30·064	29·699	94·7	65·0	79·8	106·0	56·4	97·0	69·3	115·4	58·0	*Nil*	...	*Nil*
	Geraldton	29·908	29·904	30·115	29·796	78·8	65·0	71·9	86·6	57·8	84·5	65·9	110·8	51·0	*Nil*	...	40
Inland:	Hall's Creek	...	29·826	29·963	29·590	102·8	78·0	90·4	110·8	71·0	97·2	74·9	109·0	61·3	126	9	380
	Marble Bar	...	...	...	...	108·4	79·4	93·9	116·0	69·0	103·2	76·7	116·8	69·7	267	10	437
	Nullagine	29·726	29·766	29·970	29·538	109·1	77·6	93·4	114·0	70·0	99·8	74·9	113·5	66·0	197	6	495
	Peak Hill	29·745	29·848	29·940	29·550	104·0	77·0	90·5	113·0	70·0	96·4	73·6	111·8	58·6	22	2	22
	Wiluna*	29·748	29·824	29·923	29·579	101·5	75·5	88·5	110·3	66·7	94·9	68·6	109·5	55·2	117	4	249
	Cue	29·810	29·828	30·042	29·589	100·2	71·1	85·6	107·8	62·0	98·3	71·9	113·8	56·2	73	2	124
	Murgoo	...	...	...	...	100·0	69·5	84·8	107·0	60·3	...	...	...	...	*Nil*	...	*Nil*
	Yalgoo	29·819	29·831	30·065	29·580	97·6	66·5	82·0	107·0	58·0	96·7	69·0	116·2	53·9	42	1	44
	Lawlers	29·795	29·852	30·046	29·549	100·1	74·6	87·4	109·8	64·2	93·9	70·5	113·9	51·8	110	7	338
	Laverton	29·828	29·916	30·120	29·606	99·9	72·5	86·2	112·0	62·0	89·8	66·4	108·0	53·7	152	5	339
	Menzies	29·844	29·898	30·107	29·666	96·5	69·1	82·8	107·0	58·0	91·5	66·4	112·8	47·8	296	7	296
	Kanowna	...	...	...	...	94·7	67·1	80·9	104·5	60·0	...	...	...	...	117	4	159
	Kalgoorlie	29·878	29·934	30·201	29·613	94·3	67·8	82·3	105·5	59·0	90·2	63·7	115·0	48·2	63	5	63
	Coolgardie	29·855	29·918	30·163	29·579	93·6	66·2	79·9	105·0	58·1	90·2	62·1	114·3	47·4	87	7	128
	Southern Cross ...	29·878	29·904	30·166	29·602	96·3	63·0	79·6	108·2	52·8	91·8	62·1	112·0	46·6	98	9	101
	Kellerberrin	...	...	...	...	...	...	...	...	...	...	...	...	...	58	2	64
	Walebing*	...	...	...	...	89·4	59·1	74·2	98·0	47·8	89·5	60·3	109·7	46·4	115	5	165
	Northam*	...	...	...	...	91·9	61·0	76·4	100·3	52·7	90·8	60·5	110·1	45·5	*Nil*	...	23
	York	29·928	29·946	30·245	29·625	90·8	65·0	75·6	100·0	52·3	91·5	60·8	115·6	45·8	*Nil*	...	19
	Guildford	...	...	...	...	85·3	60·2	72·8	95·0	50·4	88·4	60·2	108·8	42·0	7	2	80

The Climate of Western Australia during February, 1906—*continued.*

Locality.	Barometer (corrected and reduced to sea-level). Mean of 9 a.m. and 3 p.m.	Average for previous years.	Highest for Month.	Lowest for Month.	Shade Temperatures. February, 1906. Mean Max.	Mean Min.	Mean of Month.	Highest Max.	Lowest Min.	*Average for previous Years. Mean Max.	Mean Min.	Highest ever recorded.	Lowest ever recorded.	Rainfall. Points (100 to inch) in Month.	Wet Days.	Total Points since Jan. 1.
South-West and South Coast:																
Perth Gardens	29·939	29·960	30·236	29·651	83·7	62·9	73·3	92·0	55·0	87·4	63·0	109·6	47·2	44	5	125
Perth Observatory ...	29·950	29·956	30·220	29·620	80·5	61·7	71·1	89·3	53·6	84·7	63·4	106·8	47·7	42	5	122
Fremantle	29·980	29·956	30·243	29·651	75·8	63·6	69·7	82·0	55·8	81·6	64·8	106·0	48·5	16	4	65
Rottnest	29·963	29·930	30·237	29·620	74·7	64·0	69·4	80·2	56·0	78·6	65·2	109·0	56·6	22	3	33
Mandurah	...	...	...	...	80·7	60·4	70·6	91·2	52·2	84·3	60·0	101·2	43·3	74	3	136
Marradong	...	...	...	...	...	...	...	...	...	...	...	...	...	29	3	106
Wandering	...	...	...	...	84·8	55·1	70·0	96·0	44·5	...	...	...	...	14	2	50
Narrogin	...	...	...	...	32·8	56·0	69·4	92·8	48·5	...	...	...	...	23	1	61
Collie	...	...	...	...	82·6	53·8	68·2	94·0	40·2	84·6	51·2	100·7	37·0	42	2	148
Donnybrook*	...	...	...	...	81·3	56·2	68·8	93·5	42·9	84·2	54·2	102·0	36·9	53	3	221
Bunbury	29·958	29·990	30·215	29·637	77·8	59·1	68·4	85·0	46·2	82·7	58·7	101·5	44·2	50	3	151
Busselton	...	...	...	...	80·6	56·4	68·5	90·4	42·1	81·0	54·2	95·8	43·2	70	3	101
Cape Naturaliste ...	29·974	...	30·271	29·679	73·3	60·8	67·0	78·2	52·0	...	...	...	...	57	3	115
Bridgetown	...	...	...	...	81·8	52·4	67·1	95·0	38·2	84·0	49·1	101·0	35·2	58	2	168
Karridale	29·975	30·026	30·220	29·580	75·0	57·0	66·0	81·0	41·0	76·4	56·7	105·5	41·4	107	6	252
Cape Leeuwin	29·955	29·990	30·250	29·510	74·0	63·0	68·5	77·0	59·0	73·6	62·3	103·8	54·8	167	9	261
Katanning	29·942	29·978	30·271	29·677	85·0	56·7	70·8	96·8	45·0	84·7	55·1	109·0	37·9	168	3	185
Mt. Barker	...	...	...	...	79·1	54·0	66·6	93·0	40·0	...	...	...	...	106	5	208
Albany	29·962	30·028	30·271	29·780	76·1	57·2	69·6	90·0	45·4	73·2	57·9	94·4	41·5	110	6	169
Breaksea...	29·955	30·022	30·290	29·690	73·3	61·0	67·0	81·0	57·0	69·8	60·1	81·5	50·0	172	8	227
Esperance	29·945	30·024	30·286	29·730	78·6	63·0	70·8	107·0	49·2	77·6	60·5	109·8	42·2	72	4	81
Balladonia*	29·948	30·005	30·262	29·567	91·1	58·5	74·8	110·2	51·8	84·5	56·1	111·0	43·6	90	4	112
Eyre	29·888	30·012	30·178	29·501	85·2	65·9	75·5	114·8	51·5	78·9	61·0	110·2	40·9	10	2	245
INTERSTATE.																
Perth	29·950	29·956	30·220	29·620	80·5	61·7	71·1	89·3	53·6	84·7	63·4	106·8	47·7	42	5	122
Adelaide	29·944	29·979	30·173	29·544	92·0	66·4	79·2	108·6	53·5	86·2	62·0	113·4	47·4	12	3	12
Melbourne	...	29·886	...	...	...	...	...	...	...	77·8	56·6	109·5	40·3	...	...	...
Sydney	30·050	29·973	30·270	29·870	80·6	69·0	72·0	97·0	60·0	77·2	64·8	101·0	49·3	38	...	259

* Averages for three years only.

The Observatory, Perth, February, 1906.

W. E. COOKE, Government Astronomer.

RAINFALL for January, 1906 (completed as far as possible), and for February, 1906 (principally from Telegraphic Reports).

Stations.	January. No. of points. 100 = 1in.	January. No. of wet days.	February. No. of points. 100 = 1in.	February. No. of wet days.
East Kimberley:				
Wyndham ...	641	12	431	11
6-Mile	...	...	...	...
Carlton	...	...	...	...
The Stud Station	...	...	...	...
Argyle Downs ...	...	...	...	...
Rosewood Downs	..	...	...	...
Lisadell	...	...	...	...
Turkey Creek ...	548	13	498	12
Ord River ...	...	...	...	...
Alice Downs ...	...	...	...	...
Flora Valley ...	...	...	...	...
Hall's Creek ...	254	11	126	9
Nicholson Plains	...	...	...	...
Ruby Plains ...	...	...	...	...
Denison Downs	...	...	...	...
West Kimberley:				
Mt. Barnett ...	...	...	...	...
Corvendine ...	...	...	...	...
Leopold Downs...	...	...	...	...
Fitzroy Crossing (P.O.)	331	16	1,247	12
Fitzroy Station ...	...	...	...	...
Quanbun ...	...	...	...	...
Nookanbah ...	...	...	...	...
Upper Liveringa	666	17	...	...
Mt. Anderson ...	...	...	...	...
Yeeda	319	6	...	...
Derby	597	11	460	9
Pt. Torment ...	607	15	...	...
Obagama ...	248	12	...	...
Beagle Bay ...	...	...	...	...
Roebuck Downs	403	10	...	...
Kimberley Downs	734	11	...	...
Broome	535	8	410	7
Thangoo ...	...	...	...	...
La Grange Bay...	867	15	308	7
N.W. Coast:				
Wallal	253	8	236	8
Pardoo	141	7	...	...
Condon	111	5	110	3
DeGrey River ...	...	...	...	...
Port Hedland ...	40	7	181	7
Boodarie ...	...	...	...	...

Stations.	January. No. of points. 100 = 1in.	January. No. of wet days.	February. No. of points. 100 = 1in.	February. No. of wet days.
N.W. Coast—*cont.*				
Balla Balla ...	...	...	...	...
Whim Creek ...	104	6	96	3
Mallina	77	2	...	...
Croydon	...	...	...	...
Sherlock ...	Nil	...	...	...
Woodbrook ...	145	4	...	...
Cooyapooya ...	85	2	...	...
Roebourne ...	37	3	38	1
Cossack	10	3	95	1
Fortescue ...	76	3	48	2
Mardie	78	2	...	...
Chinginarra ...	...	...	...	...
Yarraloola ...	50	1	...	...
Peedamullah ...	68	4	...	...
Onslow	90	4	Nil	...
Point Cloates ...	...	...	...	...
N.W. Inland:				
Warrawagine ...	355	3	...	...
Eel Creek ...	583	7	...	...
Muccan	438	9	...	...
Ettrick	...	...	...	...
Mulgie	272	6	...	...
Warralong ...	226	6	...	...
Coongon... ...	293	7	..	...
Talga	135	6	...	...
Bamboo Creek ...	459	11	124	8
Moolyella ...	...	...	...	...
Marble Bar ...	170	8	267	10
Warrawoona ...	133	5	313	4
Corunna Downs	85	8	...	...
Mt. Edgar ...	...	...	...	...
Nullagine ...	298	9	197	6
Middle Creek ...	131	5	...	...
Mosquito Creek	151	6	...	...
Roy Hill... ...	217	7	...	...
Bamboo Springs	...	...	...	...
Kerdiadary ...	265	5	...	...
Woodstock ...	..	...	...	...
Yandyarra ...	397	8	...	...
Station Peak ...	162	7	...	...
Mulga Downs ...	86	5	...	...
Mt. Florence ...	63	5	...	...
Tambrey ...	299	11	...	...
Millstream ...	386	5	...	...
Red Hill... ...	...	...	...	...
Mt. Stewart ...	446	5	...	...

RAINFALL—*continued.*

Stations.	January.		February.	
	No. of points. 100 = 1in.	No. of wet days.	No. of points. 100 = 1in.	No. of wet days.
N.W. Inland—*cont.*				
Peake Station ...	...	...	...	...
Nanutarra ...	...	...	...	...
Yanrey	56	5	...	...
Wogoola... ...	...	...	...	...
Towera	169	4	...	...
Gascoyne:				
Winning Pool ...	44	2	19	2
Coordalia ...	...	...	...	...
Wandagee ...	143	4	...	...
Williambury ...	331	4	...	...
Yanyeareddy ...	286	4	...	...
Maroonah ...	370	2	...	...
Ullawarra ...	...	...	...	...
Mt. Mortimer ...	...	...	...	...
Edmunds ...	187	3	...	...
Minnie Creek ...	...	...	...	...
Gifford Creek ...	...	...	...	...
Bangemall ...	...	...	...	...
Mt. Augustus ...	...	...	...	...
Upper Clifton Downs	...	...	...	...
Clifton Downs ...	...	...	...	...
Dairy Creek ...	20	2	...	...
Mearerbundie ...	...	...	...	...
Byro	Nil	...	...	...
Meedo	Nil	...	...	...
Mungarra ...	...	...	...	...
Bintholya ...	...	...	...	...
Booloogooroo ...	...	...	...	...
Doorawarrah ...	90	4	...	...
Brick House ...	55	3	...	...
Boolathana ...	26	3	...	...
Carnarvon ...	30	3	Nil	...
Dirk Hartog ...	...	...	...	...
Shark Bay ...	Nil	...	Nil	...
Wooramel ...	2	1	Nil	...
Hamelin Pool ...	Nil	...	Nil	...
Kararang ...	Nil	...	...	...
Tamala	Nil	...	...	...
Yalgoo District:				
Woolgorong ...	Nil	...	...	...
New Forest ...	...	...	...	...
Yuin	Nil	...	...	...
Pindathuna ...	...	...	...	...
Tallyrang ...	Nil	...	...	...

Stations.	January.		February.	
	No. of points. 100 = 1in.	No. of wet days.	No. of points. 100 = 1in.	No. of wet days.
Yalgoo District—*contd.*				
Mullewa ...	7	1	Nil	...
Kockatea ...	16	1	Nil	...
Barnong ...	...	...	...	...
Gullewa	7	2	Nil	...
Gullewa House...	...	...	...	...
Gabyon	Nil	...	...	...
Mellenbye ...	20	1	...	...
Wearagaminda...	14	1	10	1
Yalgoo	2	1	42	1
Wagga Wagga ...	Nil	...	...	...
Muralgarra ...	Nil	...	...	...
Burnerbinmah ...	36	3	Nil	...
Nalbara	9	2	3	3
Wydgee	12	1	...	...
Field's Find ...	Nil	...	Nil	...
Rothesay ...	...	...	...	...
Ninghan ...	Nil	...	...	...
Condingnow ...	Nil	...	...	...
163-Mile ...	22	1	76	3
Palaga Rocks ...	153	2	65	3
126-Mile ...	36	2	...	...
90-Mile	61	2	...	...
Mt. Jackson ...	...	...	...	...
Murchison:				
Wale	...	...	...	...
Yallalonga ...	...	...	...	...
Billabalong ...	Nil	...	...	...
Twin Peaks ...	...	...	...	...
Murgoo	Nil	...	Nil	...
Mt. Wittenoom ..	2	2	...	...
Meka	Nil	...	...	...
Wooleane ...	Nil	...	..	...
Boolardy ...	...	...	...	...
Woogorong ...	5	1	...	...
Manfred ...	Nil	...	...	...
Yarra Yarra ...	4	2	...	...
Milly Milly ...	24	2	...	...
Berringarra ...	Nil	...	...	...
Mileura	Nil	...	...	...
Mt. Gould ...	4	1	...	...
Moorarie ...	Nil	...	...	...
Wandary ...	...	...	...	...
Peak Hill ...	Nil	...	22	2
Mt. Fraser ...	...	...	...	...
Abbotts	Nil	...	30	3
Belele	Nil	...	...	...

RAINFALL—*continued.*

Stations.	January. No. of points. 100 = 1in.	January. No. of wet days.	February. No. of points. 100 = 1in.	February. No. of wet days.
Murchison—*contd.*				
Meekatharra	...	...	...	...
Star of the East	Nil	...	26	3
Nannine	Nil	...	138	5
Annean	Nil	...	...	...
Tuckanarra	Nil	...	...	...
Coodardy	135	2	...	...
Cue	51	4	73	2
Day Dawn	70	3	42	4
Lake Austin	47	3	34	3
Lennonville	3	2	73	4
Mt. Magnet	13	3	29	3
Youeragabbie	Nil	...	...	...
Murrum	73	1	...	...
Challa	41	3	75	7
Nunngarra	Nil	...	81	2
East Murchison:				
Gum Creek	9	1	...	...
Dural	52	2	...	...
Wiluna	62	5	187	4
Mt. Sir Samuel	252	3	263	5
Leinster G.M.	271	3	...	...
Lawlers	228	6	110	7
Lake Darlôt	...	...	62	5
Darda	...	...	...	...
Salt Soak	168	3	...	...
Duketon	118	3	...	...
North Coolgardie Goldfields:				
Burtville	...	...	...	...
Laverton	187	6	152	5
Mt. Morgans	86	1	244	5
Murrin Murrin	119	3	201	6
Mt. Malcolm	213	3	77	6
Mt. Leonora	139	3	81	5
Tampa	124	2	...	...
Kookynie	39	3	105	7
Niagara	52	4	197	7
Yerilla	85	3	249	5
Yundamindera	146	3	239	4
Mt. Celia	...	...	...	...
Edjudina	Nil	...	...	...
Quandinnie	10	1	...	...
Menzies	Nil	...	296	7
Mulline	115	3	213	7
Mulwarrie	42	4	76	6
Goongarrie	132	3	520	7

Stations.	January. No. of points. 100 = 1in.	January. No. of wet days.	February. No. of points. 100 = 1in.	February. No. of wet days.
Coolgardie Goldfields:				
Waverley	...	...	...	...
Bardoc	25	2	92	4
Broad Arrow	10	1	253	5
Kanowna	40	2	117	4
Kurnalpi	39	3	180	7
Bulong	15	2	87	8
Kalgoorlie	Nil	...	63	5
Coolgardie	41	2	87	7
Burbanks	46	2	89	8
Bulla Bulling	12	2	120	...
Woolubar	81	2	75	6
Waterdale	133	2	137	8
Widgiemooltha	45	2	138	7
50-Mile	152	3	...	...
Norseman	55	4	182	9
Lake View	48	1	...	...
Frazer Range	33	2	...	...
Southern Hills	...	...	...	...
Yilgarn Goldfields:				
129-Mile	41	1	...	...
Emu Rocks	...	...	...	...
56-Mile	26	1	...	...
Glenelg Rocks	39	2	53	6
Burracoppin	Nil	...	54	3
Bodallin	Nil	...	...	...
Parker's Road	Nil	...	46	3
Southern Cross	3	3	98	9
Parker's Range	16	5	...	...
Yellowdine	9	1	143	8
Karalee	Nil	...	160	5
Koorarawalyee	18	2	288	10
Boorabbin	Nil	...	240	6
Boondi	14	1	203	8
South-West (Northern Division):				
Murchison House	24	1	8	1
Mt. View	Nil	...	...	...
Mumby	67	1	6	1
Northampton	80	1	7	1
Chapman Experimental Farm	36	1	Nil	...
Narra Tarra	...	...	...	...

RAINFALL—*continued.*

Stations.	January. No. of points. 100 = 1in.	January. No. of wet days.	February. No. of points. 100 = 1in.	February. No. of wet days.
South-West (Northern Division)—*contd.*				
Oakabella ...	75	1	3	1
White Peak ...	...	...	...	...
Geraldton ...	40	1	Nil	...
Hinton Farm ...	50	...	...	...
Tibradden ...	...	...	...	...
Myaree	39	1	...	...
Sand Springs ...	25	1	...	...
Nangetty ...	8	1	...	...
Greenough ...	30	1	Nil	...
Bokara	55	1	3	1
Dongara ...	32	1	Nil	...
Strawberry ...	Nil	...	Nil	...
Yaragadee ...	...	...	...	...
Urella	14	1	...	...
Opawa	13	1	99	1
Mingenew ...	27	1	4	1
Yandenooka ...	Nil	...	190	1
Carnamah ...	17	2	4	1
Watheroo ...	49	2	...	...
Nergaminon ...	23	2	...	...
Dandaragan ...	37	1	16	2
Yatheroo ...	31	1	...	...
Moora	19	1	Nil	...
Walebing ...	50	3	115	5
Round Hill ...	23	1	Nil	...
New Norcia ...	45	3	20	3
Wongon Hills ...	...	...	...	...
Wannamel ...	33	1	Nil	...
Gingin	43	3	5	2
South-West (Metropolitan):				
Wanneroo ...	60	2	Nil	...
Belvoir	47	2	14	2
Wandu	77	4	18	6
Mundaring ...	100	2	...	...
Canning Waterworks	135	4	17	2
Kalbyamba ...	104	2	23	4
Guildford ...	73	2	7	2
Perth Gardens ...	81	2	44	5
Perth Observatory	80	3	42	5
Highgate Hill ...	85	2	...	...
Subiaco	77	2	30	5
Claremont ...	61	1	...	...
Fremantle ...	49	2	16	4
South-West (Metropolitan)—*cont.*				
Rottnest	11	2	22	3
Rockingham ...	34	1	20	1
Jandakot ...	134	3	32	3
Armadale ...	...	...	...	...
Mundijong ...	108	4	38	5
Jarrahdale ...	235	4	44	5
Jarrahdale (Norie)	...	...	...	...
Serpentine ...	95	4	27	5
Extreme South-West:				
Mandurah ...	62	3	74	3
Pinjarra (Blythewood)	90	4	108	3
Pinjarra	82	3	75	3
Upper Murray ...	130	4	93	5
Yarloop	105	4	100	2
Harvey	118	3	...	...
Brunswick ...	110	2	74	3
Collie	106	4	42	2
Glen Mervyn ...	133	3	...	...
Donnybrook ...	168	3	53	3
Boyanup ...	138	3	81	3
Bunbury ...	101	4	50	3
Busselton ...	31	3	70	3
Quindalup ...	67	5	...	...
Cape Naturaliste	58	7	57	3
Glen Lossie ...	59	8	113	7
Karridale ...	145	6	...	...
Cape Leeuwin ...	95	10	167	9
Lower Blackwood	111	4	12	1
Ferndale ...	179	2	...	...
Greenbushes ...	139	3	57	2
The Peninsula ...	...	...	...	...
Bridgetown ...	110	5	58	2
Hilton	95	2	...	...
Greenfields ...	111	4	20	2
Cundinup ...	45	2	...	...
Wilgarup ...	139	6	...	...
Balbarrup ...	123	2	87	1
Bidellia ...	249	4	...	...
The Warren ...	...	...	...	...
Westbourne ...	83	6	...	...
Deeside	131	5	...	...
Riverside ...	105	4	...	...
Mordalup ...	81	4	...	...
Lake Muir ...	112	4	...	...

RAINFALL—*continued.*

Stations.	January. No. of points. 100 = 1in.	January. No. of wet days.	February. No. of points. 100 = 1in.	February. No. of wet days.
Eastern Agricultural Districts:				
Emungin ...	54	4	10	5
Dowerin ...	42	2	...	...
Warramuggin ...	...	...	...	...
Monglin... ...	...	...	...	...
Hatherley ...	...	...	...	...
Momberkine ...	20	1	...	...
Eumalga ...	39	1	...	...
Newcastle ...	23	1	3	1
Craiglands ...	...	...	...	...
Eadine	31	3	4	1
Northam ...	23	2	Nil	...
Grass Valley ...	10	1	Nil	...
Cobham	37	3	7	1
York	21	3	Nil	...
Yenelin	...	...	...	...
Meckering ...	89	2	26	2
Cunderdin ...	...	...	...	...
Doongin... ...	Nil	...	Nil	...
Whitehaven ...	...	...	...	...
Mt. Caroline ...	34	2	27	2
Cutenning ...	35	2	...	...
Kellerberrin ...	36	3	28	2
Cardonia ...	26	2	...	...
Baandee ...	107	2	18	1
Nangeenan ...	Nil	...	...	...
Merredin ...	20	1	19	3
Codg-Codgen ...	67	5	55	5
Noongarin ...	...	...	...	...
Mangowine ...	32	2	...	...
Yarragin ...	36	3	95	3
Wattoning ...	...	...	...	...
Great Southern Railway Line:				
Dalebridge ...	...	...	...	...
Beverley ...	25	1	Nil	...
Brookton ...	63	1	...	...
Sunning Hill ...	60	2	...	...
Pingelly ...	35	2	2	1
Yornaning ...	41	3	12	2
Narrogin ...	34	4	17	2
Narrogin Experimental Farm	38	2	23	1
Wagin	11	1	75	1
Katanning ...	17	1	168	3
Sunnyside ...	26	2	207	4
Broomehill ...	15	1	249	2
Great Southern Railway Line—*contd.*				
Woodyarrup ...	13	2	158	3
Pallinup... ...	...	...	...	...
Tambellup ...	18	3	291	8
Toolbrunup ...	39	2	112	1
Cranbrook ...	34	3	...	...
Stirling View ...	...	...	215	3
Kendenup ...	32	2	163	2
Woogenellup ...	23	3	...	...
Wattle Hill ...	90	10	129	10
St. Werburgh's...	53	6	157	4
Mt. Barker ...	52	6	156	5
West of Great Southern Railway Line:				
Talbot House ...	27	1	Nil	...
Jelcobine ...	21	2	9	2
Bannister ...	49	2	...	...
Wandering ...	36	2	14	2
Glen Ern ...	22	2	...	...
Marradong ...	77	3	29	3
Wonnaminta ...	18	2	14	3
Williams ...	26	2	30	3
Rifle Downs ...	...	...	...	...
Darkan	...	...	...	...
Arthur River ...	26	1	12	2
Glenorchy ...	63	3	...	...
Kojonup ...	56	3	139	4
Blackwattle ...	47	2	118	2
Warriup ...	...	...	153	4
Forest Hill ...	62	9	...	...
East of Great Southern Railway Line:				
Sunset Hills ...	67	2	...	...
Oakdale	160	3	...	...
Barrington ...	88	2	7	1
Bally Bally ...	72	2	...	...
Stock Hill ...	33	1	...	...
Qualin	20	1	3	1
Woodgreen ...	35	2	6	2
Gillimanning ...	28	2	...	...

RAINFALL—*continued.*

Stations.	January.		February.	
	No. of Points. 100 = 1in.	No. of wet days.	No. of Points. 100 = 1in.	No. of wet days.
East of Great Southern Railway Line—*cont.*				
Wickepin ...	10	2	...	...
Crooked Pool ...	40	3	...	...
Bunking ...	22	1	...	...
Bullock Hills ...	...	...	...	...
Dyliabing ...	47	3	...	...
Glencove ...	35	2	81	2
Cherillalup ...	...	...	...	...
Mianelup ...	51	2	230	3
Woolganup ...	43	4	308	3
Chillinup ...	28	2	...	...
Jarramongup ...	...	...	...	...
South Coast:				
Wilson's Inlet ...	54	8	63	2
Grasmere ...	63	9	67	5
King River ...	...	...	...	...
Albany	59	10	110	6
Point King ...	66	7	130	3
Breaksea ...	55	11	172	8
Cape Riche ...	60	2	339	5

Stations.	January.		February.	
	No. of Points. 100 = 1in.	No. of wet days.	No. of Points. 100 = 1in.	No. of wet days.
South Coast—*cont.*				
Peppermint Grove	60	6	...	...
Bremer Bay ...	36	4	223	4
Coconarup ...	24	3	...	...
Ravensthorpe ...	26	6	11	5
Cowjanup ...	27	7	...	...
Hopetoun ...	19	4	Nil	...
Fanny's Cove ...	20	2	...	...
Park Farm ...	24	1	...	2
Grass Patch ...	Nil	...	68	5
Swan Lagoon ...	29	2	79	5
30-Mile	37	3	67	
Gibson's Soak ...	25	3	81	7
Myrup	25	2	...	...
Esperance ...	9	2	72	4
Boyatup	23	2	...	...
Lynburn ...	...	...	...	...
Middle Island ...	...	...	...	...
Point Malcolm ...	60	4	239	10
Israelite Bay ...	54	4	87	9
Balbinia	134	4	...	...
Balladonia ...	22	5	90	4
Eyre	235	5	10	2
Mundrabella ...	237	4	...	...
Eucla	211	5	6	4

The Observatory, Perth,
7th March, 1906.

W. E. COOKE,
Government Astronomer.

By Authority: A. Curtis, Acting Government Printer, Perth.

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EDITOR'S NOTES.

Enormous Importation of Bacon and Pork.—In the returns just received from the Imperial Department of Agriculture it is stated that for the twelve months just ended England imported twenty million pounds' (£20,000,000) worth of pork and bacon.

Butter Production.—During the twelve months ending 31st December, 1905, California produced 41,961,047 pounds of butter. This enormous quantity was actually marketed, and does not include that consumed by the families of the various dairymen.

Live Stock Judging.—An effort is being made by the York Agricultural Society to establish a Live Stock Judging Association for this State. This is a move in the right direction, and it is to be hoped that the York Society will receive ample support from kindred societies and so make the project a successful one.

Grading Seed Wheat.—A very important matter to the farmer is the proper grading of wheat for sowing. From experiments tried it has been proved most conclusively that graded wheat has yielded nearly double that of ungraded; and as the cost is a mere trifle, it is a wonder that our farmers use anything else.

THE WOOL TRADE.—In this issue will be found extracts taken from the annual review issued by Messrs. Goldsbrough, Mort & Co. Some of the figures are quite startling; for instance, the clip this year has reached the enormous amount of one million four hundred thousand bales. This quantity is far above that ever anticipated in the wildest dreams of a few years back.

GOVERNMENT POULTRY EXPERT.—The poultry expert to the Department, Mr. Frank H. Robertson, is now located at the Narrogin State Farm, where all communications should be addressed to him direct. He is reorganising the poultry department there, and will supervise the egg-laying competition which is to commence there on the 1st of May next. There are some good Toulouse geese and bronze turkeys for sale at one guinea each. There are no eggs for sale just at present, but in about a month's time eggs should be for sale from the following breeds, viz.:—White and brown leghorns, silver and golden wyandottes, and black orpingtons.

WATERING HORSES WHEN WARM.—The danger of giving a horse cold water when he is warm after any work or exertion consists in the sudden chill which is induced by the cold water, combined with cessation of exercise, which lowers the heart's action and lessens the force of circulation. Cold water should be given to horses very sparingly at all times. Let the temperature of a horse's body be reduced to normal before letting him drink. If at the end of a day's journey, let him pick about first, or give him his feed; after a while let him have a drink, but not much. While travelling, a drink will not do any harm providing the horse is kept on the move afterwards.

DRY WINES FOR HOT CLIMATES.—A very interesting, though long report, full of interest to wine-growers, has just been made by Mr. E. T. Bioletti, who was for some time viticulturist at Elsenburg. The main feature consists in the advice laid down, that if it is required to make a dry wine in a hot country, the methods must be those suitable to the climate and not those used in a cold climate. Mr. Bioletti's experience is that, although the best of grapes may be grown in hot countries, it invariably happens that the manufacture of the wine is carried out on precisely the same lines as that used in the colder European countries.

NEW METHOD OF DRESSING FLAX.—A grower in New Zealand has invented a process of producing clean flax without the intervention of the scutching machine. The flax plants are subjected to the operation of a high-pressure water jet, which breaks up the epidermis, washes away all vegetable tissue, and leaves the fibre absolutely clean and beautifully white. No bleaching is therefore required as under the usual process of paddocking. A point of great importance is that the fibre is not broken, consequently there is no loss in the shape of tow as with the present machines, and there are no tail ends wasted. If this process can be successfully and cheaply applied to New Zealand flax, it may be possible that other fibre plants, such as the sisal, ramee, manilla, and the Queensland banana, can be treated in like manner.

Hop-growing in Western Australia.—Some few days ago the Agricultural Department received from the Hamel State Experimental Farm a sample of sun-dried hops. These were submitted to Mr. Hardwick, manager of the Swan Brewery, and he states that he is astonished to see that hops of such excellent quality are produced in this State. He says they are equal to the best Tasmanian hops, and should be worth 1s. 3d. to 1s. 4d. per lb. Hops are rather low on the market at the present time, and last year they would have been worth about 6d. per lb. above the price mentioned, or 1s. 9d. to 1s. 10d. per lb. Mr. Hardwick is of opinion that there should not be the slightest necessity for Western Australia to import hops if they can be produced here up to the quality of the sample submitted by Mr. Berthoud. Two Victorian gentlemen, interested in the brewing trade, who saw the sample, stated they were surprised at the quality of the exhibit, and asserted that nothing equal to the sample is produced in Victoria.

Foot-rot in Sheep.—A report on experiments in the curing of foot-rot in sheep, by walking them through a shallow bath, appears in the *Journal* of the British Board of Agriculture. Early in 1904 the board distributed 30 baths (16 feet by 1 foot), each accompanied by 1cwt. of copper sulphate, to a corresponding number of sheep farmers in Great Britain. The instructions supplied were that sheep should be walked once a month or oftener through a five per cent. solution of the substance (1lb. in two gallons of water) after the hoofs, in the case of a bad attack, had been cleaned and dressed. Reports from most of the recipients have now come in, and they are quite unanimous in ascribing much benefit to the use of the bath. But it appears that still better results will be got by using a 10 per cent. solution (1lb. of copper sulphate to one gallon of water), and in stubborn cases the sheep should be put through the bath as often as once a week. For prevention a five per cent. solution is strong enough, and treatment at longer intervals is sufficient. The use of a bath saves much labour in the application of the remedy. A fine day should be chosen for the treatment, in order that the sheep may have dry land to run upon after it.

Malting Barley.—"I understand," says Mr. Grasby, in the *Western Mail*, "that approximately 100,000 bushels of malting barley are required annually in Western Australia; but so far not six per cent. of it is grown in the State. I also understand that good malting barley is usually readily saleable up to the above quantity at about 4s. per bushel. Farmers in suitable districts will see that this a matter worthy of a little thought. On the western side of Northam, around Newcastle and York, and down to say Beverley, seems to be almost ideal barley country. I do not know the early spring conditions fully enough to warrant my speaking of farther south, though I shall not be surprised to be told that right down past Katanning is as good, and in drier seasons even better. To get good malting barley a cool spring is desirable to permit of the full development of the grain and to prevent too rapid ripening. I believe that the Co-operative Producers' Union are in consultation with the Swan Brewery Company and the Pneumatic Malting Company with a view to the supplying of first-class seed and the guaranteed purchase, up to the State requirements, of the suitable barley grown. This is a practical opportunity of promoting agriculture, and

farmers who like the idea should communicate with the Union." There is yet a very important point to bear in mind by all who attempt growing malting barley, and that is the very careful threshing it requires. This has been pointed out in the columns of the *Journal* a number of times, and therefore it is hardly necessary to reproduce it again.

THE RABBIT PEST.—A meeting of gentlemen largely interested in the pastoral and agricultural industries was held recently at the United Service Hotel. Mr. James Morrison presided, and among those present were Messrs. F. Wittenoom, J. H. Church, J. Foulkes Taylor, A. O. Gillam, Frank Craig, T. F. de Pledge, F. Connor, J. N. Durack, M. C. Davies, S. P. Mackay, J. Munro, G. J. Gooch, R. E. Weir, A. G. Leeds, O'Neill, Walsh, Withall, Buzacott, and W. Ponton, jun. Apologies were intimated from Mr. Chas. Harper, Mr. McLarty, and Mr. D. K. McRae. Mr. Morrison briefly explained the object of the meeting, and called on Mr. Leeds, who read a letter from the Council of Advice, Rabbit Destruction Fund, Sydney, detailing the steps which had been taken there towards bringing out the eminent bacteriologist, Dr. Danysz, of the Pasteur Institute, to experiment in connection with the discovery of a disease for the extirpation of the pest. After Mr. Ponton had described the ravages of the rabbits in the Balladonia district, and after the matter had been fully discussed, it was proposed by Mr. F. Wittenoom, "That it is desirable that a fund be started to assist the central committee in New South Wales to bring the expert to that State to determine whether a disease can be introduced that will destroy rabbits without injuring other stock." The motion was seconded by Mr. G. J. Gooch, and supported by several of those present. The following local committee was formed:—Messrs. J. C. Butcher, A. R. Richardson, E. F. Darlôt, Ross Anderson, M. C. Davies, James Munro, S. P. Mackay, and A. G. Leeds. At the close of the meeting several donations from those present towards the fund were announced, and subscriptions will now be solicited by the members of the local committee.

AMALGAMATED AGRICULTURAL SOCIETIES.—A strong movement is on foot in various districts in this State having for its object the amalgamation of the chief agricultural societies of Western Australia. It is suggested that the Royal Agricultural Society should take the matter up. Mr. Theo. Lowe, its secretary, in writing to the secretary of the Northam Agricultural Society, said:—"As promised in my letter of 24th August, I placed your communication *re* affiliation before my committee on Tuesday last. After your letter was read considerable discussion took place, and I was asked to inform you that my committee are prepared to join in an affiliation of the principal Agricultural Societies of this State, provided there is a favourable opinion expressed by the various societies, and this society is asked to become the governing body. With this end in view, my committee trust that your society will address the others on the subject and acquaint them with the result at a date as early as possible." At a meeting of the members of the Royal Agricultural Society, held recently, the delegates from the country agricultural associations considered the question of affiliation with the society. After considerable discussion, it was decided that the whole of the agricultural societies in the State should affiliate with the

Royal Agricultural Society; and it was resolved that the Royal Agricultural Society should be requested to draw up a scheme of affiliation on the following basis:—(1) To prevent the clashing of show dates, (2) concerted action in approaching the Government on questions of general interest to the affiliated societies, (3) for the better classification of stock, so as to prevent the offering of prizes for crossbred sires, (4) to adopt the rules and regulations of the Royal Society so far as is practicable, (5) to assist affiliated societies in any possible way, (6) to uphold any disqualification made by the affiliated societies, (7) to improve the present system of appointing judges.

CLEAN FOOD FOR HOGS.—The hog possesses certain habits which are apt to create the impression that he is a lover of filth, and while it is true that he possesses a few cleanly habits, yet, after all, in this matter other farm animals are more circumspect in their mode of living. The hog's short neck makes it almost compulsory for him to partly climb into his trough at feeding time, and if attention is not paid to keeping the feeding ground clean there will be considerable filth devoured. While a hog will devour more impurities than any other farm animal, yet his system is by no means designed to handle these economically, and successful hog breeders generally take great pains to feed pure food. One common mistake in feeding hogs is to use refuse from the kitchen that is not only worthless as a food, but decidedly injurious to the digestive system. We have observed cases where all forms of dishwater were carefully reserved for the porkers, and in this semi-liquid, semi-solid conglomeration there is generally considerable soapsuds. Now soap is an excellent thing in its proper place, but as an aid to digestion it is a decided failure. Indeed it is decidedly injurious, and we have known many instances where hogs were thrown out of condition and stunted in their growth by its use. Next in the list of injurious substances to soapy water, or swill as it is generally called, is that of supplying muddy drinking water. We fully appreciate the fact that where running water is not available one of the most difficult tasks before the stockman is that of supplying his hogs with fresh clean water during the summer. Their nature is such that they simply will persist in taking possession of their drinking fountain with their dirty bodies, or if there is not room for the whole body then they will be there with all-fours. We have found that a good drinking fountain with a surface just large enough to get their noses in is about the best piece of apparatus that a hogman can own. If these are attached to barrels or tanks and a supply of cinders or gravel placed around it so as to prevent a mud hole from forming, one may have reasonable success in supplying hogs with clean water. Where the old-fashioned V-shaped trough is used the top should be well latticed so that the hogs cannot wallow in it, and even then the lattice work should be constructed so as to be easily removed in order to facilitate a thorough cleansing at least once a week. Filth in the water trough will, in our opinion, weaken the digestive system of the hog and render him a prey to disease quicker than any other one thing. Many a person feels that he cannot afford the expense of fitting up proper watering places for hogs, but where any considerable number are kept the outlay will be returned.

RAPE-GROWING.—One of the best crops to grow in the orchard at the present time is rape, which can be eaten off during the winter and ploughed under in early spring. Not only is it a good green manure, but it also

ranks high as a fodder plant. On the New Zealand experimental farms, after very carefully conducted experiments, the summarised conclusions were:—(1.) That with pigs from one to 10 months' old, an acre of rape, when properly grown, has a higher feeding value than maize. (2.) That rape is a better green feed for growing pigs than good clover pasture, the pigs fed upon rape having made, on the average, 100lbs. of gain on 33·5lbs. less grain than was required by the pigs fed upon clover. (3.) That rape is the most satisfactory and cheapest green feed for pigs that we have fed. It was found, however, that pigs should not be turned upon a rape pasture until the plants are at least 12 to 14 inches high, and that rape is not a satisfactory feed when fed alone. Grain ration or other food must be added to secure live weight gain. Neither should dairy cattle be fed exclusively upon rape. The cows are very fond of it, but, fed alone, it undoubtedly taints the milk. As green food for poultry it is unsurpassed, and was largely used for this purpose at the late laying competitions at the Hawkesbury College. Apart, however, from its great value for fattening lambs and sheep, it is of immense value in recuperating worn-out wheat paddocks, the results from such cultivation being almost past belief. At the Dookie Experimental College, Victoria, land which was so worn out with constant cropping that the last crop was not worth cutting, was sown with rape, fed off with sheep and cattle, sown with Chevalier barley, and yielded five bushels to the acre of a splendid malting sample; and this in a year when the total rainfall was under 15 inches. It is a deep-rooting plant that improves the mechanical condition of the soil, but it has not the same power of assimilating nitrogen from the air that is possessed by clovers, cowpeas, lucerne, or other leguminous plants. Its high quality as a fodder will be understood better by saying that it has the remarkable nutritive ratio of 1 to 2·9, which means that it contains one part of flesh-forming substance to every 2·9 parts of starch or heat-giving substances. It is about the cheapest crop that can be put in, for the best dwarf Essex imported English variety can be usually bought at 4d. per pound, or about 28s. to 30s. per cwt., so that the cost of seeding only runs into from 9d. to 1s. per acre. Growers should insist on having the above variety. Cheaper rapes are imported for bird-feeding from Japan and elsewhere, but these samples are frequently full of wild turnip or yellow weed, which runs away to seed sometimes before the rape is fit to be fed off, and this yellow weed is a curse that will poison the land for years. When the cost of seeding with the best seed is so slight, farmers are very foolish to run any risks with low-priced seed. Sheep farmers should not neglect to put in a good area of rape if possible. It can be ploughed in as green manure, or cut and fed to any stock, or it makes excellent ensilage.

SILOS AND ENSILAGE.

PAPER BY THE DIRECTOR OF AGRICULTURE.

The following paper was read before the Farmers' Conference, at Busselton, by the Director of Agriculture, Mr. C. F. Chaplin:—

I am pleased to be present at this conference of farmers. Such conferences as this I have been advocating in the several districts throughout the State, and your coming together in this manner, and expressing your views, and giving your experiences of work on the land, cannot but be of great value. Indeed, as head of the Agricultural Department, I will endeavour to encourage these meetings as much as possible. Any papers that may be read dealing with agricultural subjects, or subjects that affect the husbandman, if forwarded to the Department in Perth, will have publicity in the *Agricultural Journal*. By this means the experience of the farmers in the various districts as to different climatic conditions and crop production will be disseminated. It will be of very great interest for one farmer to know what another farmer is doing in the matter of stock-raising, and in the growing of crops generally.

In this locality the dairying industry is apparently on the move, and, after securing first-class dairy cattle, the next important matter is the question of feeding them. In this district of Busselton, with its temperate climate and liberal moisture, the supply of fodder for dairy cattle should not cause farmers much anxiety. Green fodders, such as maize, the millets, sorghum, teosinte, and many others, do remarkably well. In fact, these fodders grow prolifically at the Narrogin State farm, and we have had green fodder all the summer. The conservation of fodder is one of the most important matters in dairy farming.

Some time ago I published an article in the *Journal of Agriculture*, which showed that, from long experience, the leading authorities in the United States contend that the best milk produced at the greatest net profit is through ensilage. The cows producing this milk are, of course, not fed exclusively on ensilage; but it is because of the cheapness and intrinsic value of ensilage as a feed that such milk can be produced so cheaply. There is no country which requires some such method of conserving fodder for dairy cattle more than Western Australia, and for this reason we would urge those farmers who desire to lay by a good store of succulent fodder for the stock during the dry period of the year, to seriously consider the value of ensilage. The interest in silage is growing rapidly among farmers in the principal progressive cities of the world. They appreciate the necessity of a cheaper ration, as well as the importance of a succulent feed. In fact, silage is now regarded as an indispensible adjunct to successful farming.

To make ensilage on proper lines it is, of course, necessary to have a silo, substantially built, in conformity with the plan experience has proven.

to be the best; but ensilage can be made successfully in the stack, and the cost of a silo thus saved to the farmer with limited means just starting on his land. There will be some loss, however, round the edges of the stack, owing to the air getting into the silo, for a distance of, perhaps, one foot; and in this regard it is debatable whether a properly-constructed silo would not pay better in the end, especially when the material used for the silage has to be grown under ordinary cultivation. As a means of directing the attention of farmers to the expediency of converting fodder by means of ensilage, and thus save the surplus growth of herbage, grass, and other fodder which stock will eat, for a time when green feed has gone from the farm, some advice is given hereunder regarding the making of stock ensilage, because it is the cheapest and least expensive method.

Advantages of the Stack System.

Some of the advantages of the stack system of making ensilage are explained by Mr. A. Conlon, the Government Dairy Instructor in Tasmania, and the experiences of this gentleman are worth recording. He refers to the fact that "An ensilage stack can be put up anywhere in the field, and a great saving in cartage thus effected. It is also easier," he contends, "to make sweet ensilage in the stack-form than by the use of rigid silos, and a stack has unlimited capacity—that is, it can be made of any size, suitable to the quantity of fodder grown. There is also less waste in the larger stacks, owing to the fact that the larger the stack the less the exposed surface in proportion to the mass."

There are two kinds of silage, sweet and sour. It is with the former that we are concerned in the present instance, as being the most suitable to make under the stack system. It is in controlling the result, or in other words, in the production of sweet or sour at will, that the whole art of ensilage exists. If, after carting the green material, heavy pressure be at once applied, the air is excluded, and the temperature of the mass is consequently kept at a low level. When, by this means, the temperature is prevented from rising above 120 degrees Fahr. to 150 degrees Fahr., sour ensilage results. For the production of sweet ensilage the mass must not be weighed to any great extent before the temperature has reached from 130 degrees F to 150 degrees F. Care must be taken not to allow the temperature to rise above 160 degrees F., or the stack will become overheated and burnt. The intelligent use of the thermometer is the chief factor in successful ensilage making; and to neglect this and the few simple details referred to, failure in the quality of ensilage would result. An ordinary floating dairy thermometer is the most convenient type to use, an iron pipe of slightly larger diameter being built into the middle of the stack in a vertical position. The thermometer may then at any time be lowered by a string, and the temperature taken at any required depth.

How to Build the Stack.

The site for the stack should be level, and a thick layer of straw should be laid down as a foundation. The size and shape of the stack is governed by estimating that, for every three tons of hay the crop would have produced, about 10 tons of silage may be reckoned on. Having arrived at an approximate estimate of the weight, the base measurements should be somewhat as follow:—For 15 tons 9 x 9 feet, 20 tons 10 x 10 feet, 50 tons

13 x 13 feet, 100 tons 16 x 16 feet. Only as much of the crop as can be carted and stacked in one day should be cut: a day or two should elapse before adding new material. This allows the temperature to rise, and also the mass to subside, which facilitates the work of stacking. In the ordinary haystack the sides are built projecting outwards—this must be carefully avoided in building silage stacks. It is far better to have the sides and ends inclining inwards, for there is then less tendency for the stack to lean over, which frequently happens owing to fermentations, causing unequal settling of the mass. Should this occur, props must be set—at a wide angle—to the leaning side, when, on further subsidence taking place, the pressure brought to bear will bring the stack back to the perpendicular.

From the first load to the completion of the stack the greatest attention should be paid to the outside edges. This is a very important point. The outsides should always be kept higher than the centre when stacking, and should be made much more compact by being well trodden down, the centre being left comparatively loose. When finished, the top should be levelled, and covered with a layer of straw, pressure being then applied by piling the handiest material procurable on the top, so that a deadweight of about 1cwt. per square foot is secured. Stack ensilage has been successfully made without any pressure other than the weight of the material being used for ensilage, but when no pressure is applied more loss occurs round the edges of the stack.

Any succulent growth, so long as it contains nothing deleterious to stock, may be made into ensilage in this manner, or special crops may be grown for the purpose. Surplus growth of grasses which frequently abound in the fields during the spring time should be cut and stacked as ensilage, thus providing excellent fodder for the dairy cattle when the dry period of the year comes round. It is necessary to fence the ensilage stack securely to keep away the stock, for once they get a taste of ensilage it is difficult to keep them from rushing it, no matter how good the surrounding food. A mixture of rye and tares makes excellent ensilage by stacking. Of course, when valuable fodder, such as maize, sorghum, and the millets referred to are used, the best way is to put them into a properly constructed silo, because under the stack system there is sure to be some waste round the edges of the stack which are not impervious to air, and probably the loss occasioned through this would, in a year or two, pay for the cost of constructing the silo. The depth of your silage stack should be made as great as practicable, because, in this way, the largest amount of food per cubic foot can be stored. There is less loss relatively at the surface. In the silo a strong lateral pressure forces the silage against the walls so closely that less air enters and hence there is less loss.

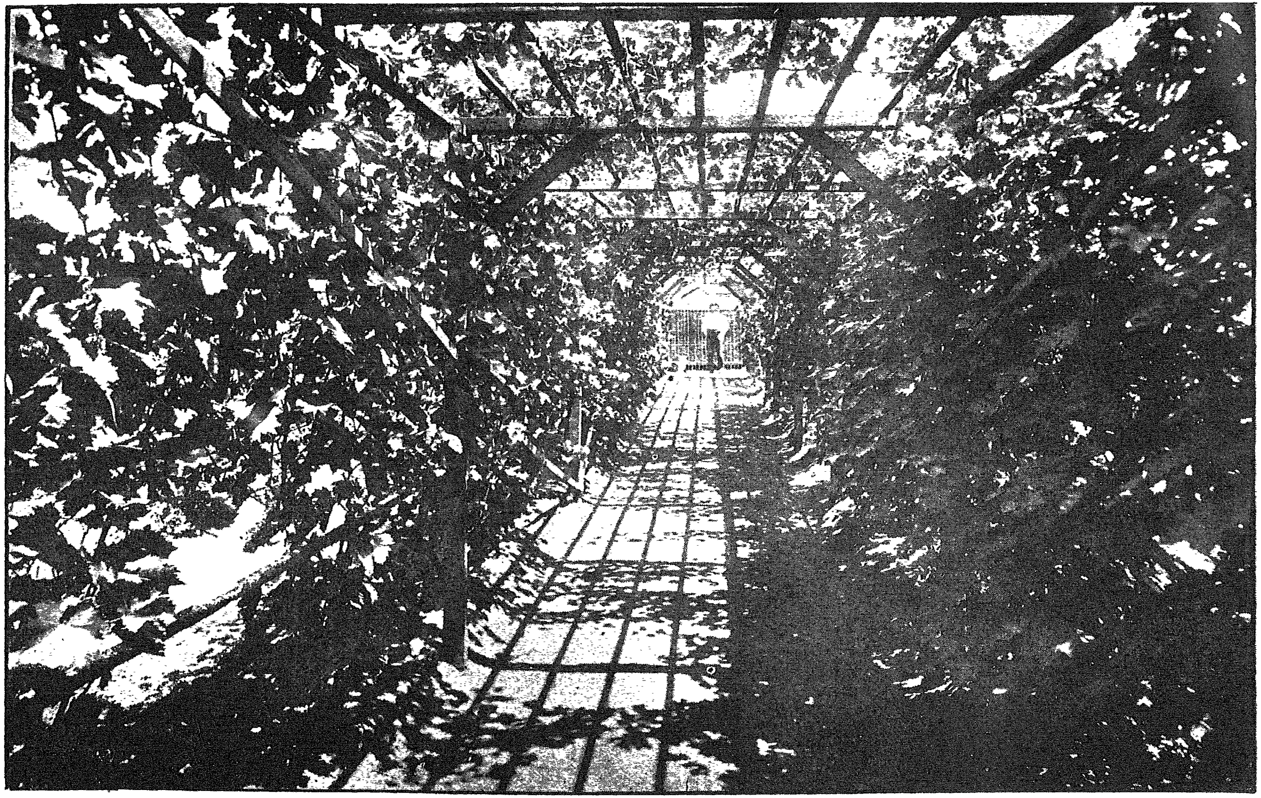
It is the intention of the Department of Agriculture to prepare a plan and specification of a cheap and serviceable silo, the cost of which will come within the reach of almost every farmer.

Professor King supplies the following dimensions regarding silos:—"A silo 15ft. in diameter and 30ft. high holds of well-matured green silage 30 tons. The amount of silage which may be stored in a silo increases in a higher ratio than the depth increases. A silo 36ft. deep will store nearly five times the amount of feed that one of 12ft. will. Doubling the diameter of the silo increases its capacity more than fourfold, and a silo 30ft. in diameter will hold more than nine times as much as one 10ft. in diameter.

each of the same depth. It is clear from this that small silos must be relatively more costly than those of a larger diameter. In the construction of silos it is very important to have the horizontal dimensions such that the rate of feeding shall be rapid enough not to permit moulding to occur to the exposed or feeding surface. It is also important to have the horizontal dimensions as large as possible, because the larger the silo the less it costs in proportion to the feed it stores. Then, too, narrow, small silos do not allow the silage to settle as well, and hence in them the necessary losses are proportionately greater than in the larger ones. Observations indicate that if silage is fed down at a rate slower than 1·2in. daily, moulding is liable to set in. This is more likely to be true in the upper half of the silo than in the lower half, but it will be prudent to have the silo of such diameter as to lower the surface more rapidly in feeding than is necessary rather than less rapidly. A silo 30ft. deep will allow 1·5in. in depth of silage per day for 240 days, and one 24ft. deep will allow 1·2in. for the same time. The mean weight of silage per cubic foot for a silo 30ft. deep is 39·6lbs., and allowing 40lbs. of silage per cow per day, it is seen that a cubic foot of silage on the average will feed a cow one day. If the silo is 24ft. deep, there will be required 1·114 cubic feet of silage to give the desired weight."

Danger in Filling Silos.

It should never be forgotten in connection with the filling of silos that carbon dioxide is generated very rapidly the first few days after the silage is put into the silo, and it sometimes happens that, if the air be very still overnight, and if the surface of the silage is a considerable distance below any door, carbonic acid accumulates in sufficient quantity over the silage to make it impossible for a man to live in it. Cases are on record (according to the "Physics of Agriculture") where people have been suffocated by going into a silo under these conditions. If the doors in a silo are so close together that a man standing on the silage will have his head above an open door, the carbonic acid gas will flow out of the door and not accumulate to such an extent as to be injurious. In cases where the silage is below any opening far enough to leave a man's head below the opening, care should be taken not to go into the silo in the morning after filling has begun until after the machinery has been started. After the silage has been dropping into the silo for a few minutes it will stir the air up sufficiently to render it pure enough for a man to work in it without danger. Ordinarily the air currents outside are sufficiently strong to render it pure enough for a man to work in it without danger. Ordinarily, the air currents outside are sufficiently strong enough to prevent the carbonic acid from accumulating, but it should be kept in mind that it is possible on still nights for this accumulation to take place.



A. H. ALBERTS, Ward Street, Kalgoorlie.

SHEEP.

PAPER BY THE CHIEF INSPECTOR OF STOCK.

The following paper was read before the Farmers' Conference at Busselton recently by the Chief Inspector of Stock, Mr. R. E. Weir, M.R.C.V.S. :—

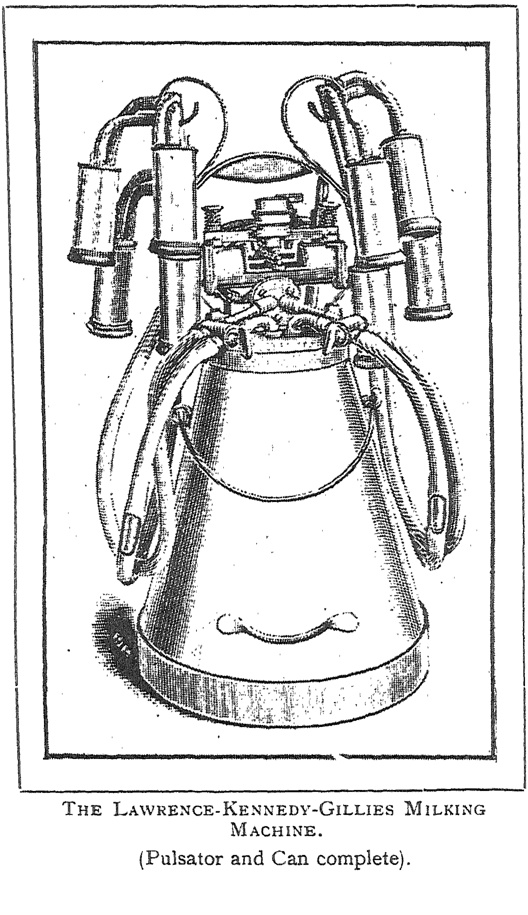
The subject allotted to me for my address this evening is, I find, entitled "Sheep for Farmers," but it has occurred to me that if "Cows" had been substituted for "Sheep" the subject would be more appropriate for the conditions prevailing in this particular district. However, I am here to comply with your wishes, and I trust that any information I can supply will prove of some future value to you in the treatment of this class of animal.

I presume you have chosen this subject because, not only is it the most profitable branch of farming at the present time, but also, it is the easiest method by which wealth can be secured with the least amount of labour or anxiety to the owner. Not only are sheep profitable in themselves, but they are of great value in improving the fertility of the soil. When turned on to stubble land, besides improving in condition, they keep the ground free from weeds and add to the productiveness of the soil. The class of sheep for farmers to invest in is undoubtedly the large framed Merino of mature age. These crossed with either the Lincoln or Shrop will result in the production of a strongly-built and well-woolled lamb, which, if well nourished from birth, will realise when three months old, about 12s., then allowing a fair average price of 5s. for the wool clip from the dam, very nearly, if not quite the full value of the sheep has been obtained, as presumably it was originally secured for from 16s. to 17s. In the keeping of sheep for farmers, lamb-raising is undoubtedly the object to be aimed at, as, in my opinion, from this system of sheep husbandry, more rapid and better results are obtained. It follows then, that the sire to be used will be the Lincoln, as the progeny from such a cross are worthily reputed to be excellent breeders and produce a very superior quality of wool. On the other hand the Shropshire cross gives a considerably more marketable lamb though in the production of wool there is a deficiency of both quality and quantity. The time is not far distant when this branch of the farming industry will in such a manner forge ahead that an export trade will be entered upon, the establishment of which will mean a considerable increase of wealth to the State.

It is, however, of little advantage for me to point out the benefits to be derived from this source unless every effort is going to be made by individuals to improve their holdings and lay down pastures of a succulent nature. There is little benefit to be derived from purchasing stock coming from parts where conditions are favourable and placing them on coarse and unnutritious pasture where but a livelihood may be eked out but nothing more. It is therefore necessary for the successful development of this industry that every effort should be made to break up the virgin land and have the natural herbage replaced with grasses which are short and succulent in character. It is now well known that a great proportion of Western Australian lands is deficient in lime salts, and if owners wish to preserve

their stock from the influence of disease they should ascertain the inequalities of their land. This can only be done by means of soil analysis. On certain lands of the State, where it has been ascertained that a deficiency of lime salt exists, stock owners have been troubled for several years with a cripply condition of their young animals noticeable from the time of their birth. This disease has now been investigated, and has proved to be due to an ulcerated condition of the anticular cartilages resulting from a want of phosphate of lime in the food supply. This can be easily remedied by supplying the necessary ingredients to the soil in the form of manure. Temporary means can also be employed by supplying the stock direct, and placing in troughs a mixture of lime salt and bone meal. Such a procedure might be resorted to under any circumstances, and it will be found useful for stock running in paddocks. It should be placed conveniently at all drinking waterholes.

With the exceptions where the cause is traceable to (1) the deficiency of earthy salts in the soil, (2) to the coarse nature of the food supply, and (3) certain climatic conditions, sheep are wonderfully free from disease in this State. Certain conditions have, however, to be guarded against, especially when removing sheep from dry country rapidly and transferring them to green succulent pasture of an abundant nature. If allowed to too freely partake of such luscious herbage, a liability to contract inflammation of the bowels is incurred, and the mortality under these circumstances is often considerable. A little careful management in such instances will prevent losses of this nature, as, when the flock is allowed to partake sparingly of this food for at least 10 days (or until they become used to the changed conditions) the trouble will be averted and the animals will be occasioned no inconvenience. A somewhat similar condition results from sheep travelling over long dry stages of country, and when arriving at young green feed they are allowed to partake too freely. The result is that the weakened digestive organs become overtaxed, gas is generated in the rumen, and the animals suddenly succumb to tympanitis or hoven. Treatment must not be delayed in such instances. The flock requires to be immediately removed to sparcer and drier pasture, and the infected animals operated upon by inserting the blade of a pocket knife in the most prominent part of a swelling on the left side. As the result of certain climatic conditions, travelling sheep in particular are subject to ophthalmia or inflammation of the outer covering of the eye. This usually occurs in the summer months when sudden changes of the weather occur. Exposure in bleak open paddocks is also frequently a cause of the complaint, and as shelter is indispensable when stock are retained within fenced country it is necessary that provisions should be made in this direction, especially when the land is being denuded of its native forest. Clumps of trees can be left where the greatest amount of protection is required from the prevailing winds, and the result will be beneficial both to stock and pasture. Should the country be denuded of timber, suitable trees can be planted, and if protected for a few years an improvement will be effected both in the value and the appearance of the holding. The spread of the disease is often due to flies, dust, etc. The disease rapidly spreads amongst the flock until quite a large percentage show such a serious condition of blindness that free movement is completely hampered. When it occurs with such seriousness to travelling sheep the person in charge should immediately rest the flock in a well-shaded pasture, and have the affected animals treated by means of bleeding from the angular vein which runs down the face or inner corner of the eye.



THE LAWRENCE-KENNEDY-GILLIES MILKING MACHINE.

(Pulsator and Can complete).

MILKING MACHINES.

By Percy G. Wicken.

In a report to the Director of Agriculture on milking machines, Mr. Wicken says:—I have made a number of inquiries and obtained a lot of information about the milking machines, on which I beg to report as follows:—

(1.) There are two machines on the market, the "Hartnett" and the Lawrence-Kennedy-Gillies machine (L.K.G.). The Hartnett machine has been made for some time, but up to the present none have been put to a practical test, except one small plant at Canterbury (Vic.), which is run by the inventor. I visited this plant and saw it in operation. It requires two vacuums, at different pressures, to operate it. The principal advantages claimed for it are an automatic releaser which throws the cups off the cows when the milk-flow falls below a certain amount. A Hartnett machine was shown at the Melbourne Exhibition. A Hartnett machine is being installed at Dookie Agricultural College on trial for six months, as it is a locally made article and the price is lower.

(2.) The other machine is the Lawrence-Kennedy-Gillies, known as the L.K.G. This machine has been tried in many places, and as there are several hundreds in use in Victoria and the other States, it is well past the experimental stage. I took several opportunities of visiting centres where these machines are installed and talking with the people using them, verifying the reports I had heard, seeing the machines at work, and collecting information from all sources.

In connection with this matter, I visited the Hawkesbury College, in New South Wales, where I had heard they had a complete milking plant installed, and was disappointed to find they had only one machine, and only worked that for a few cows. Although the Principal, Mr. Potts, spoke well of the machine, there was no information to be gained there which would induce a farmer to purchase a milking machine.

I also took the opportunity to visit Colac, where there are a number of machines at work, and in company with the manager of the butter factory (the largest in Victoria) I visited several dairymen who are working the machines. Mr. McInnes was one of the first settlers to have milking machines installed, and has had them at work for more than two years, and is thoroughly satisfied with the results. At this establishment three boys, with the three machines, milk 130 cows in three hours. To do this by hand would take six good hand milkers. Mr. McInnes estimates that each man milks 14 cows per hour, when in full milk, with the machine. In addition to helping to solve the labour problem, there is a good profit attached to the use of the machine. The plant cost about £150, and Mr. McInnes was able to reduce his labour bill by £4 10s. per week, and it follows that the machine would soon pay for itself and yield a good profit from its use.

A Mr. Neville, of Colac, also has several machines at work, and obtains similar results.

After the exhibition I had two days to spare, and paid a visit to Camperdown, where a Mr. W. Podger has the largest installation in Victoria, viz., six machines. I saw the machines at work, and had a talk with Mr. Podger, and also his manager, both of whom had nothing but good to say of the machines. Mr. Podger milks from 150 to 250 cows; at the time of my visit, as the season was very dry, they were only milking 150 cows. Three of the machines were operated by girls, and three by lads; there is very little work attached to the use of the machines, and the milkers were all clean and tidy, and the bails and yards very clean. At present the cows are not milking well, and each milker puts through about 24 cows per hour, but when the flow is good they average from 16 to 18 cows per hour. Six employees have milked 250 cows, by machines, in $2\frac{3}{4}$ hours.

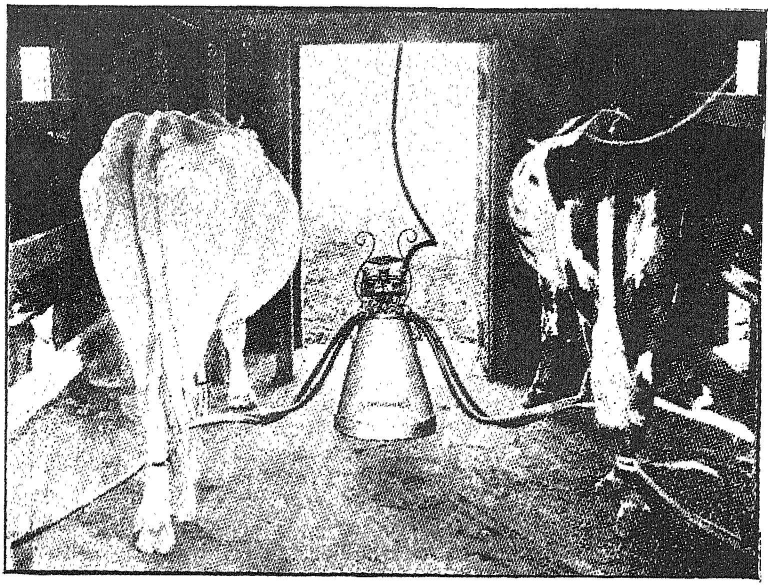
Mr. Podger used to employ 12 hand milkers at 30s. per week (wages and keep) before installing the machines, and was always in trouble over labour; now he only employs six, and consequently saves £9 per week in wages alone, the outlay for the plant being about £250. Mr. Podger also considers the cows are better than when milked by hand. He has had the machines for two years, the cost of repairs has been a mere trifle, and he would not be without the machines now.

Mr. Brisbane, at Werrite, about eight miles from Camperdown, who has some very good Ayrshire cattle, has two L.K.G. machines installed, and his men state that they can milk 18 cows per hour with each machine. At the time of my visit they were only milking the cows once a day, but find it pays to use the machines on them until they are quite dry. Mr. Brisbane uses an ejector to create the vacuum in place of an engine. This is considerably cheaper in first cost, but is expensive in working, owing to the consumption of fuel and water.

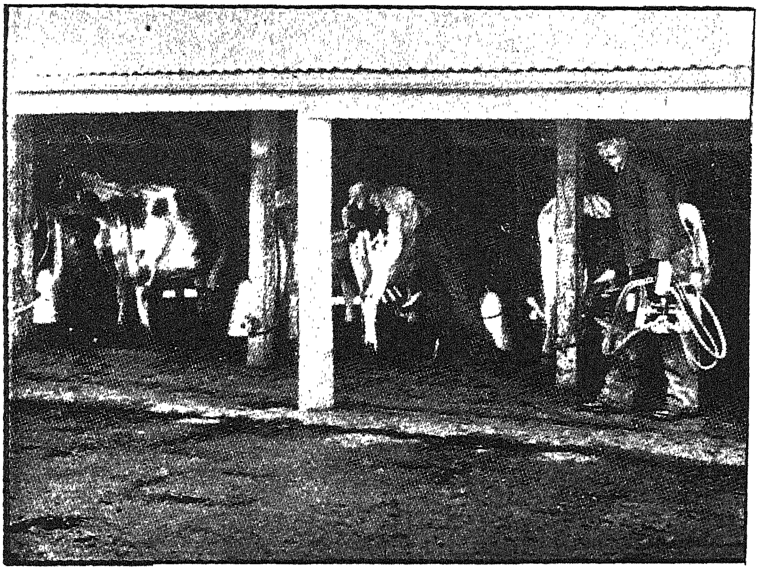
A Mr. Codger, at Warnambool, milked 82 cows in $2\frac{1}{2}$ hours, with two machines, by himself. I thought of going down to see this done, but while I was in Victoria Mr. Codger was only milking 50 cows, and they were not giving much milk, and as I had seen the other places I did not make the journey.

(3.) Some people who have not used the machines state that the cows become affected in the udder through the use of these machines. I made particular inquiries on this subject everywhere I went, and the people state emphatically that this is not so; in fact, they all say that there are less cases of sore teats than when hand milking is practised. Mr. Potts, the Principal of the Hawkesbury College, stated that they had had no bad effects. Mr. O'Callaghan, the N.S.W. Dairy Expert, would not speak positively on the subject, but could not give any instances of cows affected ever having come under his notice. Mr. Crowe, the Victorian Dairy Expert, states that he had heard of no bad results to cows due to the use of the milking machines.

(4.) The price of the L.K.G. machine, for a two-machine plant without the motive power, as per quote attached, together with pulleys and belting, would be about £100. This would provide sufficient plant to milk between 30 to 40 cows per hour by two men.



The Lawrence-Kennedy-Gillies Milking Machine in operation at Camperdown, Victoria.



The Lawrence-Kennedy-Gillies Milking Machine in operation at Mr. W. Brisbane's, Weerite, Victoria.

(5.) To sum up, the L.K.G. milking machine is now beyond the experimental stage, and is working in hundreds of places daily and giving practical commercial results. It will probably be improved on in the future, as all machinery is, but at present it is capable of doing all that is expected of it; it is a great saving of labour and does not injuriously affect the cattle. As the result of my observations, I have no hesitation in recommending these machines for installation on the proposed State dairy farms. The labour problem is one of the greatest in connection with dairying in Western Australia, and these machines help largely to solve it. The main thing to be observed by users of these machines is cleanliness; all parts must be kept clean, otherwise trouble soon follows. The machines should be cleaned and sterilised each day after use.

COTTON CULTIVATION.

By C. F. Chaplin, Director of Agriculture.

Actual experiments have shown that cotton can be successfully produced along the entire Western seaboard of this State South of Derby. Evidence to this effect is to be found at the New Norcia Mission, the Beagle Bay Mission, and on the Greenough Flats. At the latter place cotton was successfully grown 30 years ago, while at Hamel, and in the South-West generally, cotton has been found to grow luxuriantly.

Cotton, having a long, deep tap root, is well able to withstand drought, and will thrive on poor land better than almost any other farm crop. Clay loams, well drained, and sandy loams resting on clay, are highly recommended for cotton. Both should contain a fair amount of vegetable matter. The choicest crops are grown near the sea. The market value of cotton fluctuates less than almost any other kind of crop. Cotton thrives best in a warm or hot atmosphere, and does not require so much rain as grain or grass. The cotton plant is a sun-loving plant, and plenty of sunlight means plenty of cotton. Western Australia has a great advantage over other countries, such as America, in cotton growing owing to the absence of frosts. In the United States the 37th parallel of latitude marks the Northern limit of successful cotton growing, while our Southern limit, being 35 degrees, gives us a more favourable situation than America. All things considered, cotton-growing should become one of the most successful

industries in this State, if the labour difficulty can be overcome. It is stated that a satisfactory form of machinery for harvesting the crop has been introduced, and, if this be found correct, Western Australia should become one of the leading cotton producers of the world. Ideal conditions for cotton-growing, as regards soil and climate, could be obtained all along the coast line between the 20th and 30th degrees of latitude.

Caravonica cotton, which has been produced by Dr. Thomatis, of Cairns, North Queensland, has lately come into much prominence. There are three varieties of this cotton, viz.:—

Caravonica I. (Wool).
Caravonica II. (Silk).
Caravonica Kidney.

All three varieties will thrive luxuriantly in our Northern districts, as both climate and soil are suitable. The sandy, loamy soil, and light, loose ground in many parts of the State should be most suitable for Caravonica cotton, which Dr. Thomatis believes will be the sure key to certain prosperity in W.A.; as these soils would be highly suitable to the tree cottons, which can be made to yield over £50 net of crop value yearly, it is difficult to discriminate which ones would be best to grow of these three varieties in our tropical regions. All three are equally suitable in every way.

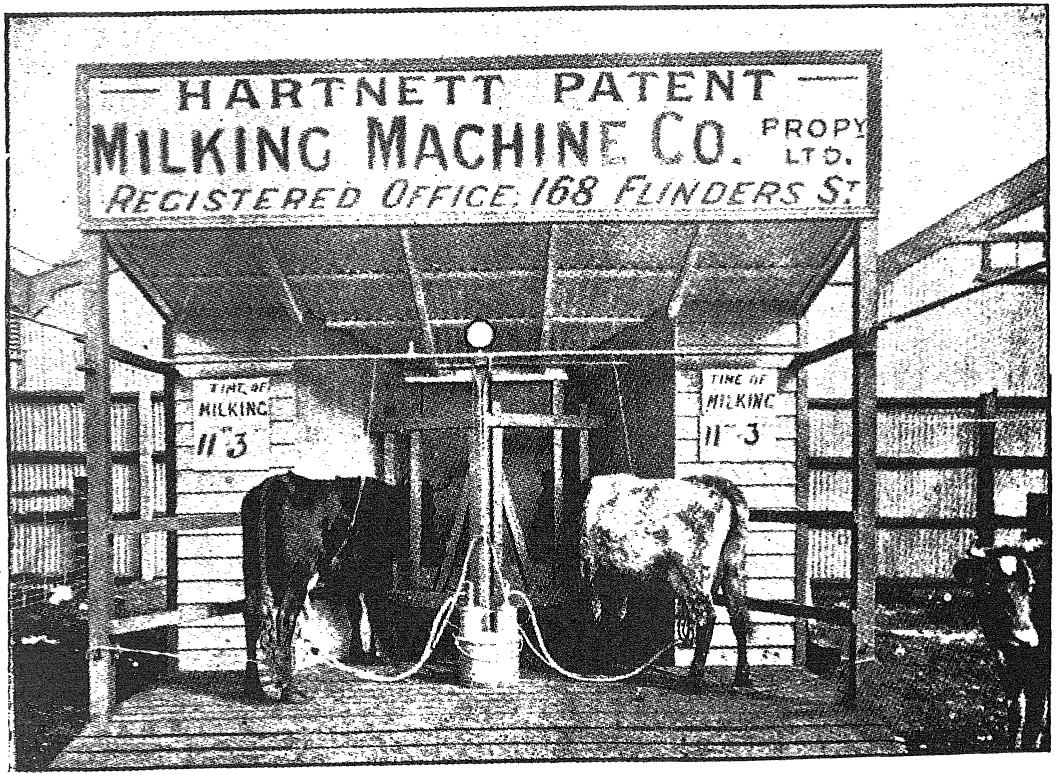
Caravonica wool has large balls and its lint is so long, even six inch staple, and so stout, as to be hardly discernible from animal wool; indeed a wool expert and buyer from Bradford, having been shown in Melbourne lately a sample of Caravonica wool cotton took it *seriously* for a real sheep's wool (merino), and insisted on knowing the brand, the name of the station, the grower, and quantity of bales available.

Commenting on these kinds of cotton, Dr. Thomatis says, "Caravonica silk cotton is the nearest approach to silk, and French and Belgian cotton mills are securing it to make silk ribbons and velveteens at 1s. 6d. per lb. of ginned lint.

The Caravonica kidney is a greatly improved variety from the indigenous stock of Peru, where it yields a poor short staple, and 24 per cent. of lint, whereas it has been so improved that the staple is strong, regular, and long, approximating that of Caravonica wool, yielding now over 40 per cent. of ginned lint. It is a large, hardy, prolific tree, it adapts itself to all kinds of seasons and climates, no matter how erratic and capricious, from inundating floods in the early season to perishing droughts. For this reason, it has won immense favour with Indian planters and governments. Caravonica kidney should thrive even in the arid regions of the tropics of Western Australia.

One lb. of seed contains about 2,000 grains, and this suffices to plant two acres at 900 trees per acre, viz., 7 x 7 feet apart.

The kidney group of seeds are to be separated and each grain sown singly. Some of the kidney seed produce the Carivonica silk tree, because, for the purpose of improving the Peruvian kidney, he had to inoculate the generative elements with the silk variety. The silk and kidney varieties may be grown alongside one another, but the wool variety should be grown far away so as to avoid crossing, which would silkify the wool, and thus slightly remove the toughness and stoutness as peculiar attributes of the wool variety.



THE HARTNETT MILKING MACHINE at work at Canterbury, near Melbourne.

If the trees are fairly well attended during the first year there is no difficulty in getting them to cover all the ground in a year, and each yields from 10 to 20 lbs. of bolls per tree; from this the weight of the crop per acre can be reckoned.

The wool variety has been raised to yield from 27 per cent. of lint to 50 per cent., or half. After the second year the trees may be pruned just after the crop is finished, viz., in February, or during the early season, and the trees will regain their proper size in July, ready for a full crop.

The culture of tree cottons is very simple and inexpensive, just like common fruit trees: merely clean the grass and weeds round the trees for the first year, and then hardly any grass or weeds will grow underneath. The planting could be done for less than £1 per acre, and the annual culture for £1 per acre with white labour scale of wages.

Planting and Cultivation.

A catch crop may be put in at the same time as putting in the cotton seed, should one desire to plough the ground; but with suitable, light, sandy, or loamy soil, Dr. Thomatis contends that there is no need to plough the ground at all for Caravonica, only hoeing and loosening patches say, one and a-half feet square and seven feet apart, and putting seed in the middle of each patch. The seed germinates in eight or 10 days. To ensure growing and saving time, two grains may be put in each patch, if one does not begrudge the seed.

Seeds should be covered one and a-half inches, the soil should be moist, and kept so either by rain or by artificial watering during germination, and for one month or so after. Stagnant water should never be allowed near the plants. In five months the tree grows over six feet high, and bears cotton. In Ceylon it grows over 15 feet high in four months. The best time to plant in the tropical regions would be from September to January, so as to ensure showers to help germination. Seed sown in the tropics from September to February will grow a crop from July to December following.

The best time to plant Caravonica in the temperate districts is about the end of September or beginning of October, so as to catch the tail end of the rains. Dr. Thomatis advises planting in temperate districts, Caravonica kidney, and Caravonica No. I. wool, as the Caravonica II. silk may feel the cold too much. In these districts seed could also be planted in April and May, at the beginning of the rainy season, but not so plentifully, as it would be against the cold weather, whereas by planting in the Spring it would go towards the warm weather, and so the young trees would enjoy the summer time.

In warm districts the same remarks apply as above, but of course the climate will be more congenial and you can sow or plant all the year round, but the Spring is the best time.

In the tropical districts sowing or planting can be done with safety, including silk cotton. The planter, however, must be guided by the rainfall or moisture for the germination and the growth of the young plantlets. In the regions of the north plant as soon as the rain commences.

The seed should be sown early to meet the beginning of the rainy season or the first light showers to bring the plantlets along and make them hardy to stand the pelting heavy rainfall of February or March.

All the sandy plains north of Broome should be the ideal country for Caravonicas; also all the low sandy soils even south of Broome. Sandy flats and sandy loams are the ideal grounds for Caravonica. When the plants are growing further directions can be given to make the trees bear in the temperate districts from November to May and in the tropical districts from June to January; that is in the respective dry seasons.

In a letter to the Director of Agriculture, Dr. Thomatis says that "There is no reason why Caravonica cotton culture should not proceed marvellously in the northern portion of the State, away from heavy frosts. I am sure," he says, "that the rainfall, the climate, and above all the sandy soil are all that Caravonica cotton require. It will give you £50 upwards nett per acre per annum, and now that I have brought the percentage of ginned lint from 30 per cent. to 42 per cent. and 50 per cent., it will be easy to gather over two tons of seed cotton per acre, and thus one ton of ginned lint after the first year; and the lint is marketable from 1s. to 1s. 6d. per lb."

Continuing, he says, "that as to fertilisers, you do not want any at least for many years. All that Caravonica wants is sandy soil, sandy lands, and heat and moisture, rain for six months, then heat, sun, and drought for the other six months, when they will bear the crop, which lasts for six months, continuously flowering, budding, and bolling! . . . The grain of seed can be put *in situ* out in the field by clearing a little square ground or land containing magnesite, or magnesis compounds, such as asbestole, talc, etc."

Although Caravonica cottons have proved to be of great vitality and commercial value in Queensland, the Department also intends to experiment with other varieties, and towards this end it has imported four varieties from Egypt; these are known as Affi, Abassi, Janovitch, and Ashmonim.

While the same seasons of the year must be observed in planting these varieties as that referred to in dealing with the Caravonica variety, for the information of intending planters it may be stated that experience has shown that the best results have been obtained by a thorough preparation of the soil and judicious fertilising.

Sea island cotton is grown most extensively on the islands and along the coast of South Carolina, Georgia, and Florida. It yields less per acre than Uplands cotton, but the lint sells for a higher price on account of its longer staple and better quality.

A report from the Louisiana Experiment Station says that "Deep and thorough preparation of the soil, followed by pulverisation, should always precede planting. The sowing of the seed should be done by some of the excellent and cheap cotton planters now in use, since only the machine will give that uniform and straight stand which facilitates the subsequent chopping. It furthermore economises the seed, a point of great importance when the true value of this article as a manure and a feed stuff is appreciated. The first ploughing for cotton may be as deep and thorough as possible, and all the subsequent workings ought to be as shallow as the character of the land will permit, since root breaking of this plant is almost a disaster.

After every heavy rain the soil should be disturbed, and during drought a shallow implement run just deep enough to break the continuity of the pores of the soil and to form an upper layer, which shall act as a mulch to conserve the moisture of the soil, is often highly beneficial.

Grass is an enemy of the cotton planter, and should never be permitted (if it be possible to prevent it) to obtain possession of the field. In cotton, as in all other crops, the hoe should be used as little as possible. It is an element of cost excessive to bear, and with this plant often causes the disease known as 'sore shin' by breaking and removing the epidermis of the tender stalk in the effort of the hoeman to remove the last spire of grass.

A practice prevails among many of the progressive planters to plant late and highly fertilise. By this means they claim a crop of grass, which so frequently infests an early planting, is destroyed. The costly hoe labour is avoided, and the plant, pushed quickly into vigour by the underlying fertiliser, soon occupies the ground and renders the after culture both simple and inexpensive. As a rule it is best to plant poor, unfertilised lands early, and rich fertilised land late. The usual distance to plant is four foot rows, and single plants 12 to 14 inches apart in the rows.

Fertilising.

The work of the experiment station, according to the 'Farmers' Encyclopœdia,' is quite concordant in showing that phosphoric acid is the most important element in any fertilising mixture for cotton. Next in importance is the nitrogen, and finally potash. The best results have been secured when all three of these elements have been combined in one fertiliser in the proportion of about $3\frac{1}{3}$ parts phosphoric acid, 1 part nitrogen, 1 part potash, or in the proportion of 1,000lbs. of acid phosphate 14 per cent., 75lbs. muriate of potash or 300lbs. kainit, and 700lbs. of cotton seed meal, or 105 bushels of cotton seed. The ingredients should be mixed and applied in such a manner as to secure from 200 to 400lbs. of the acid phosphate per acre.

Fertiliser for cotton may be either drilled in or broadcasted, and the results will be about the same by either method, but if the amount applied is small it should be applied in the drill covered about 3in. deep, and the seed planted above it. Barnyard manure, and similar bulky manures are considered more efficient as soil renovators than as specific fertilisers for cotton. They should be broadcasted liberally. The cow pea is a valuable and efficient crop in preparing the land for cotton. On plantations where the rotation is small, grain, corn, and cotton, cow peas should be sown between the corn rows at the last cultivation, and the seed harvested, the vines turned under or fed to stock, and the manure returned to the soil."

AGRICULTURAL SOCIETIES.

There cannot be any more valuable association formed, so far as our agricultural community is concerned, than that of a society at which farmers, settlers, and others can frequently meet, discuss matters of importance, and exchange ideas on every-day subjects; thus each and all can teach and learn at the same time. The value of such societies or clubs has been recognised by various governments time after time. In Western Australia more agricultural halls have been erected, and larger grants to societies made, than in any other State, taking the population served as a basis.

Yet what do we find? Unless some extra assistance is required from the government, or some special feature is to be brought prominently forward, the society or club exists only in name; it is rarely made use of. The following cutting, but truthful, remarks are taken from the *Southern Argus*, and refer to the Wagin society:—

"The members of the committee of the Agricultural Society cannot be congratulated for the manner in which they attend the meetings of the society. An important meeting was called for Saturday last, but so much interest was evinced that very few members put in an appearance, and the meeting adjourned without practically transacting any business, the correspondence being left for the next meeting to deal with. It is to be trusted that the committee will in the future give personally more attention to the affairs of the society, and leave less room for the outsiders to criticise the secretary. It is the duty of the committee to assist the secretary, and to, as far as possible, protect him from outside criticism. Members should remember that if they do not attend to business themselves and instruct the secretary how he is to act in certain matters, they must not blame him if what he has done does not meet with their approval. The secretary is only one man, and no man is infallible. Therefore those who are most prone to criticise should remember that it is their duty also to act, and that by giving the society the benefit of their own experience the importance of the shows may be raised to a higher standard, and a more amicable understanding among all concerned arrived at."

Another important phase of the question is that in those cases where a society is alive to its obligations and wish to promulgate some matter of general interest, it often suffers serious delay by the fact that, owing to the letters they send to kindred societies asking for co-operation remain unanswered or undealt with by reason of the neglect of the members of the societies to whom the letters are sent failing to fill their obligations by attending the meetings they are morally bound to do. While not wishing to make any invidious distinction, it is only fair to say that at the present time there are two matters of importance that require the attention of the whole of the societies. First, there is the appointment or formation of a Live Stock Judging Association. This subject has been introduced by the York society. Secondly, there is the important matter introduced by the Northam society having for its object the amalgamation of all agricultural societies under one head. This position has been offered to the

Royal Society, whose secretary notifies that, providing all the societies are agreeable, his society will favourably entertain the proposition.

In conclusion, secretaries cannot always be blamed for the non-attendance of members at meetings, yet they are very much to blame in not making public any business transacted when a meeting is held. Speaking for the *Journal*, its pages are always open for the publication of reports, the answering of queries, and the giving of advice. Any question to which an answer is required respecting stock, crops, fruit, farm, or vineyard should be sent to the Department and an expert officer will append the answer, together with any advice, where necessary, which will be published in the *Journal*. By this means not only will the person asking the question get the best possible reply to it, but there remains the good it will have of conveying the information to others similarly situated. The *Journal* is produced by the Government, at a direct loss, entirely for the benefit, help, and guidance of the farmer and settler. Is it not absurd that those interested do not take advantage of such valuable assistance as offered? Let the secretary of each and every society make it a golden rule to send to the Editor of the *Journal* a few lines of copy at least once a month, and let the copy contain at least one query of general interest.

POULTRY NOTES.

By Frank H. Robertson.

Poultry at Narrogin Farm.

The writer is now located at the Experimental Farm, Narrogin, which in future is to be his headquarters instead of at the Department's Offices, Perth. The work in hand at time of writing is rearranging the poultry department on the farm. The present runs are located quite close to the manager's residence, which, no doubt, is a convenient spot, but in other respects is most unsuitable, owing to the extreme hardness of the soil and the exposed position to all the winds that blow, particularly those from the West and South-West, which, at this high altitude are particularly keen in winter, which is the time of year when eggs are most wanted for early hatching; but when birds are not sheltered from cold winds, laying does not commence until the mild spring weather arrives, which is then too late for satisfactory breeding results, and precludes the possibility of supplying the heavy demands for eggs for setting purposes which are received from all parts of the State during the winter months; but it is anticipated that all orders will be promptly supplied during the coming season. The runs and

houses are all now being re-erected in a much better locality, in fact it is almost an ideal spot for poultry farming. The soil is sandy, and the fall is to the East; red-gum suckers are growing in each pen; the forest land is at the back; in front is a ploughed field, which will probably be sown with rape. The intention is to replant this area with shady ornamental trees, and in future extend the runs in this direction. To insure the comfort of the fowls in the breeding pens, the first two feet all the way round each run is of iron, thus acting as a perfect breakwind, and firebreak in case of bush fires, and affords a considerable amount of shade. There is no chance of cocks being able to disfigure each other, as so often happens when only wire-netting divides the runs. The iron is in eight feet sheets by two feet four inches wide; it is sunk into the ground about four inches, and nailed on the top edge to 3in. x 1in. jarrah, thus making a very substantial obstruction to all intruders. Above the iron is four feet of two-inch mesh wire-netting, which is nailed to the bottom and then stretched to top rails of cut sapling poles. Above this comes another two feet of wire-netting fastened to a strained wire, making a total height of eight feet, which will completely stop all flying from one pen to the other. All posts are of stout white gum saplings burnt at ground end to preserve them against decay and white ants. The fowl-houses are made of corrugated iron and sawn jarrah; they are lofty and roomy, and are erected on the front boundary of the runs. Scratching sheds are to be provided to each pen, and special arrangements are being made to make the cleaning out of the houses and the feeding and watering of the stock as easy of access as possible. The breeding pens are 30ft. x 40ft., but much larger separate runs are to be erected for cockerels, laying hens, and pullets. The intention, however, is to let a large number of the birds have unlimited run in the bush lands. The orchard, which is close at hand, will be largely availed of for chicken-rearing in moveable runs and coops. The colony system will also be adopted; and duck-raising will be largely gone in for, as at a convenient distance from the fowl runs is a gully which contains a good water supply during the breeding season. Turkeys and geese have free range and do remarkably well, picking up the greater portion of their food on the stubble fields.

The breeding stock consists of 15 Plymouth Rocks, 25 Silver Wyandottes, 23 White Leghorns, and four Golden Wyandottes. Other breeds to be kept are Brown Leghorns and Black Orpingtons. The young stock consists of 20 White Leghorns now penned off, and about 75 young White Leghorns, Silver Wyandottes, and Plymouth Rocks. Some of the cockerels will be ready to sell shortly (about 1st May). They are rather young at present. There are also for sale now some very good Toulouse geese and American Bronze turkeys. There are 21 Pekin ducks, some very fine specimens among them. It is proposed to keep also Indian Runners. The egg supply at present is small, as the old stock are moulting and the pullets have not yet commenced, as they were rather late hatched. All the birds are of good quality, and eggs of each variety of fowls will be for sale during the breeding season.

re A Correspondent's Letter.

In last month's issue of the *Journal* a correspondent offers some pertinent remarks regarding the poultry industry in this State, and he is quite right about beginning at the bottom of the ladder by educating the children attending the State Schools. The writer, during his travels, has frequently given State School teachers copies of the Poultry Pamphlet and

requested that same be used for dictation purposes. Whether the request has been carried into effect it is of course impossible to tell, but all teachers who read these notes are now invited to apply for a pamphlet and use it in the manner indicated. The fact of committing to writing information on any subject is admitted one of the best means of impressing the memory, and, unfortunately, it is a fact that the young people of this State are most apathetic in matters relating to aviculture, and if it could be made of more interest to them, there is the great probability of their taking an active part in the poultry industry of the State.

The correspondent mentions that the Government Experimental Farm should be the next step. His ideas on that subject are now running on almost the identical lines he suggests. There are some fifteen or sixteen students. Poultry farming is in progress. The writer resides on the spot, is always accessible to give information, and gives lectures. A prize is now being competed for by the students for the best paper on a recent poultry lecture, and each student has his turn at attending to the poultry.

Correspondent is perfectly correct in his remarks about ignorance of the importance of the industry and about so little having been done to encourage it in comparison to fruit and dairying. Comparisons are said to be odious, but I have always asserted that the poultry industry is quite as important as fruit-growing. Taking as a fair comparison the amount of expenditure incurred by any establishment, such as a hotel, boarding-house, or residence which is a large buyer of edible products, and ask which is the more expensive item, eggs and poultry, or fruit, the former would always be the heavier of the two. There is not the slightest doubt about the question, but that the poultry industry is far more valuable than fruit; yet public opinion does not run that way, as is proved by the amount of financial assistance extended to one in comparison to the other.

I cannot agree with correspondent in his opinions about shows, because shows make fanciers and without them the breeding of pure-bred poultry would dwindle away almost to vanishing point. The ordinary farmer would not trouble about keeping breeds pure, and without pure fowls the industry would suffer. The birds exhibited at shows are only the very choicest specimens out of large numbers bred, and their producing affords a delightful and harmless amusement to many persons. More might be done at shows to foster the utility branch of poultry, and more is being done every year in this respect. The science of aviculture is creeping along slowly but surely. It is a comparatively new study, but the next decade will see vast strides in its advancement.

Exhibition of Table Poultry.

The most interesting item in poultry matters during the past month was the exhibition of dead table poultry held at the Sydney Government Export Stores, which was originated by the Sydney *Daily Telegraph*, who gave £50 as prize money. The idea is to test the English market to definitely ascertain if a profitable trade can be opened up on the London market of Australian frozen poultry. The announcement was made some months ago and entries made by the various competitors, who thus had ample time to prepare and fatten their exhibits. The large number of 1,600 birds of various varieties were entered; of these half were exhibited, 200 rejected as being of too poor a quality to exhibit, and the remainder, 600, put into cold storage and sent to England, where they will be sold and the proceeds handed to the owners.

The show was well attended and was a great success.

Touching on the exhibition, a Sydney journal says :—

"A marked feature of the display was the position of the Black and Buff Orpingtons in the competition, single specimens scoring 94 and 95 out of a possible 100. This is indeed high merit, and should be gratifying to the respective breeders.

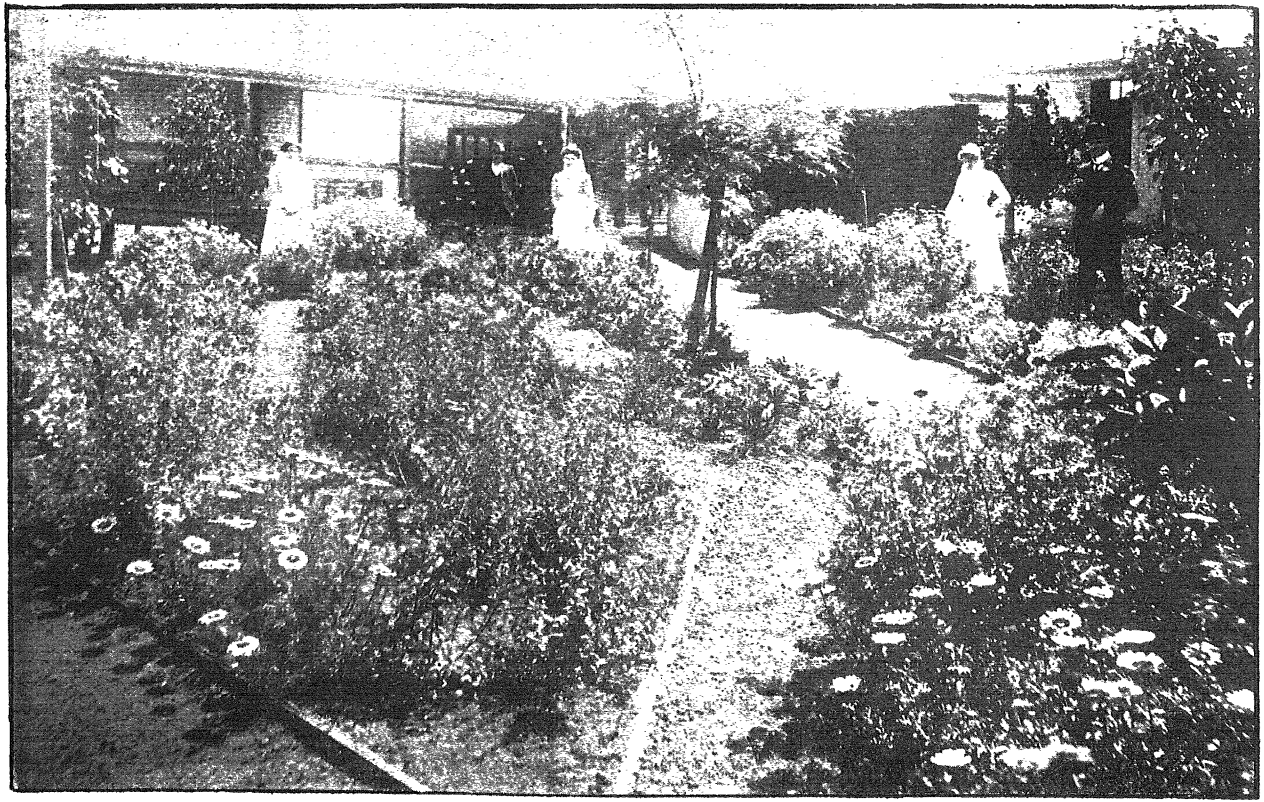
"The competition was controlled by a committee of management consisting of Messrs. S. Ellis, E. Waldron, L. L. Ramsay, F. J. Brierley, W. Harris, J. E. Dodds, J. Anderson, G. Bradshaw, and Dunnicliffe.

"Mr. G. Bradshaw, Government Grader and Poultry Expert, reports :—'One object of the promoters of the competition has been achieved, viz., the bringing together of the largest and best collection of table poultry ever witnessed in this part of the world; in fact, available records point to it being unsurpassed anywhere. That it will stimulate breeders to further effort there cannot be a doubt.

"'The competition has one important feature and effect: Quite a number of exhibits, both in fowls and ducks, are no better than the usual scraggy sorts seen in the markets, the remarkable thing being that some of the contributors of these unsightly specimens forwarded them with the belief that they were really of good quality, fit to win prizes here, and fetch payable prices in England. These breeders, when they see the exhibits of their compeers, will realise their own misconception of the business, and, it is hoped, profit thereby, and be prompted to improve their present methods, or abandon a business which must be conducted by them at a serious loss.'

"Mr. A. Hart, the judge, made some interesting comments after making the awards. 'In the first place,' he remarked, 'I am more than pleased at the collection of birds. The quality of the bulk of them is all that could be desired, and I feel sure that they will realise good prices in London. The idea of organising such a competition was a splendid step in the right direction, and the other States, I am sure, will indorse it by doing the same thing. Already Victoria and South Australia are following suit. Of course, if these competitions are continued, as it is very desirable they should be, you will get much larger entries, and, naturally, a larger proportion of choice quality. The present show, however, is the biggest and best I have seen in my 25 years' practical experience in connection with table poultry, both here and in London.

"'I would like to see the competitions more appreciated by the farmers, as poultry is one of the best and most profitable adjuncts to the farm. Nothing will give them quicker return for a small outlay than egg-production and poultry raising. Next season I should think they will more generally realise the importance of this neglected industry. This competition, I am sure, will prove to them that there is a market in England for all the chickens and ducklings that Australia can produce at the time of the year when the market is glutted here. Victoria has established a reputation for her poultry on the London market, and English buyers are in Melbourne to-day giving the highly remunerative price of 6d. per lb. live weight at the depôt for all poultry passed by the Government graders. And the class of poultry exported from Victoria is no better than the birds I have judged here this week.



Government Hospital, Coolgardie.

"'Many of the cockerels exhibited, however, are older than is desirable. They have size, but with it is coarseness. They have been kept too long, which not only makes them twice as costly to produce, but they will not bring any more in the London market than if they had been two months younger. The heavy breeds, after a certain age, build up bone and muscle, which the London buyer does not want, and won't pay for; as a result of these defects, many apparently fine exhibits do not score. The London demand is for chickens 14 to 18 weeks old, weighing from $3\frac{1}{2}$ to $4\frac{1}{2}$lbs. That is what it pays to cater for, as they can be produced for half the cost of a six or seven months' old bird. I would specially mention lot 14 (E. Waldron's Black Orpingtons) and lot 24 (P. A. Buckhorn's Buff Orpingtons) as the class of birds for London, if they had a little more breast meat on them.

"'The Black Orpingtons are a splendid lot, and if there is any fault in them it is on the side of age, and the flesh and legs being dark. If breeders of these would fatten them off for three weeks on ground oats, scalded lucerne chaff and skim-milk, together with a little wheat, they would give to the flesh that whiteness which is wanted. The quality of the Buff Orpingtons is all that could be desired, though the winners are older than I like to see. They are only superior to the Black Orpingtons in colour. The Black Orpington capons, though excellent, are not as good as they would be at nine or ten months, which age it takes to make a good capon. The first and second White Leghorn capons are the best Leghorns that have ever come under my notice. They are a splendid illustration of the fact that the only way to make a good table bird of the Leghorn is by caponising. As for the ducklings, the first six crates in the English class are all that could be desired for the London market, and I have never seen better anywhere. But it would be an improvement in future to have the ducklings sent in when 10 to 12 weeks old, while in their first feather.'"

Farmers' Fowls.

The following good advice is by H.M.P., and taken from the *Garden and Field*:—

"Now, Mr. Farmer, I should like to have just a little straight talk with you on the much-boomed poultry question. Perhaps you have read about it and even thought about it, but there are undoubtedly a very large percentage of you who do not seem to have gained much by your labours. Now, I am not going to argue about the beauties of breed, or the virtues of variety, but just simply have a little talk about the stock you have. Whether you keep Orpingtons, Wyandottes, Andalusians, etc., matters not at all; they are all one and the same, with a little difference, and the difference is not worth worrying about. What is worth worrying about is your share in the business, and that is a big share.

"Now, you, as a class, have many blessings, for you have laying competitions, and a poultry expert, and the *Garden and Field*, and you are going to have poultry experiment stations. As a matter of fact, you would not probably be disconsolate if you were bereft of the lot, and I do not know that you would be much the poorer if so sad a calamity did happen.

"Beside the above-mentioned blessings, you have a score or two of amateur and professional poultry-breeding scribblers who from week to week or month to month, as the case may be, rush violently to ink, and, with the

aid of long-suffering type, disseminate a whole lot of more or less valuable, even if contradictory, advice of which you, apparently, have decided to take no notice.

"You have been advised to keep pure breeds only, you have been advised about selection, about feeding, about management, about buying new roosters, about selling the cockerels young, and have generally had so much advice about minding your own business that I, for one, am little surprised that you are still going on in the same old way with a few score fowls which keep themselves, when they can find enough to do it on, and lay a few eggs when the storekeeper thinks and acts as if he were conferring a favour when he allows you 4d. to 6d. a dozen for them. As I have said before, I am not going to burden you with more advice on the top of all you have received. But I am wandering from the subject, which was only to suggest one little point which may have escaped your notice as a means by which more eggs, and consequently more fourpences, with possibly some increase in one shilling a dozen eggs, may be obtained. The prescription is simple; merely this: will you ask the lady, the fair partner of your joys, more commonly known, I believe, as the missus, if she will just keep an eye on those birds amongst her flock which moult early, and mark them. This early moulting is more than it seems. It is the indication of a healthy, vigorous bird, well fed and well nourished, one which is profitable in itself, and which in the breeding pen will repay the trouble its selection has caused, many times over. Ask her, too, to take note of all this season's pullets which are a fair size, well forward, and reddening up for laying, and finally, my friend, will you catch and send to market everything else on the farm that wears feathers, and calls itself a cock or a hen. Now that is all very simple, is it not? How to follow up this good beginning I will try to tell you next month."

Eggs and Table Birds.

Actual experiences in poultry farming are always interesting and instructive reading to poultry breeders, and from the Melbourne *Leader* is taken a very lucid description of two poultry yards in Victoria, one relying on egg-production, and the other on table birds; the latter does not seem to be a success, but its owner is still hopeful; it is quite certain that egg production pays best, but a combination of the two can hardly be avoided. The output of 2,500 birds is said to be the largest in Victoria; we can easily exceed this record in our State.

"The answer to the frequent question, will poultry pay? is the same as to similar inquiries in regard to the profitableness of many other industries, viz., yes; if properly managed. Leaving out of consideration the business of fancy breeding, by which the poultry stock of the country are improved, there is the practical keeping of poultry for the purpose of making profits by sending eggs or table birds to market. This industry is carried on in two ways. In the first place, it is frequently a branch of general farming; and in the second place, it is sometimes carried on by itself near large centres of population, apart from other branches of agriculture. Poultry-keeping can show remunerative returns under both methods; but the industry, when separate from the farm, also possesses a record of many failures, for the reason that skilful management is indispensable in the separately conducted business. On the farm poultry costs very little to keep, as they live for the most part on waste products. Bad management in that case results only in diminished profits. In the case of the separate poultry business, there is

actual expenditure of money and labour, and, consequently, bad management or misfortune quickly results in positive loss. The past season, for instance, has been a losing one for many poultry-keepers, owing to the high prices of feeding-stuffs; while it has not been unremunerative to the poultry branch of the farmer's business.

"Messrs. Wyett and Little, whose establishment is on the Maribyrnong side of the Saltwater River, near Ascot Vale, have during the past season sent to the Melbourne market about 2,500 birds, a little more than half of them being ducklings. This is understood to be the largest output of the season from a single poultry farmer. Operations upon a much smaller scale were commenced the previous season, and the results were so satisfactory as to lead on to the present large undertaking. When the operations of the season are reviewed the outcome is found to be disappointing. Excellent birds were produced, and good prices were obtained; but the cost of production was so great as to leave an insufficent margin for reasonable commercial profit. The causes of this unsatisfactory result are seen to be dear food, losses in incubation and rearing, and the cost of labour and superintendence. Calculations for a large poultry establishment, based on results obtained upon a small scale, are frequently misleading, and they were so in this case. The quantity of feed required by so many growing birds was under estimated, and consequently the supply provided in favourable markets run short, necessitating later purchases at very high prices. It is absolutely necessary, Mr. Wyett points out, to have cheap feeding stuff, pollard, wheat, and oats being purchased early in the season and stored. A very large proportion of the eggs, especially duck eggs, proved to be sterile. This was a great loss both of eggs and of feeding stock, and the difficulty of securing fertilisation when ducks are kept in great numbers is a very discouraging feature of the firm's experience. The subdivision of the breeding stock into small separate groups would seem to be necessary. Seven 400-egg incubators and two smaller ones are kept at work during the season, and there was a sufficient number of artificial mothers, but the losses of young chicks were greater than had been expected. It is pointed out that, while the care of the incubators is a simple matter, great care and a good deal of experience are needed for the proper management of the chicks during the first fortnight after coming out of the shell.

"The cost of attending to poultry can be much reduced by laying out the yards systematically with that end in view. Circumstances did not admit of this being done in the case under notice, and consequently much unnecessary labour was involved in carrying water and feed to the yards and houses. It has been decided to either abandon the business or shift the stock and the portable houses and fences to a larger and more suitable piece of ground. So much valuable experience has now been gained that Mr. Wyett is reluctant to discontinue an enterprise which he believes capable of returning a good profit, but he would not proceed another season without about 10 acres of ground equipped in such a way as to enable all the work to be effectively carried out without unnecessary labour. The breed of ducks handled during the season was a cross between the Aylesbury and Pekin, and the ducklings were sold at 10 or 11 weeks old in the first feather, fetching from 5s. to 5s. 6d. per pair. Orpington and Wyandotte fowls are kept, and the chicks are generally sold at 16 to 20 weeks old, but many were disposed of last season at 12 or 13 weeks old for 5s. per couple. As showing the profitableness of good feeding, it may be mentioned that while these birds were fetching 5s. a couple, there were plenty in the market of equal or

greater age selling at 2s. 6d. per couple. Much skill is required in managing the last two weeks of the feeding process in order to produce the prime condition that secures the highest price, and as the success of the export trade depends almost entirely upon the attainment of prime condition, Mr. Wyett is of opinion that the Agricultural Department ought to put forth a special effort in this direction. As this part of the business is one which it is difficult for the ordinary poultry raiser to carry out, the experts of the Department, he considered, would be acting quite in accordance with the established policy by topping up birds for export and making the necessary charges to shippers. It seems to be as necessary as the existing system of cleaning and packing carried out at the cool stores.

"A visit to the orchard, market garden, and small dairy farm of Mr. John Morey, at Cheltenham, gives us another aspect of the poultry business. As Mr. Morey is well known, not only in the fruit and vegetable markets, but also as a prizetaker for Berkshire pigs, it will be understood that his poultry yard is an adjunct to other industries. It differs also from the establishment previously visited by being devoted mainly to egg production. In this it is also representative of the larger, or farmers' section of the poultry business, the one in which there is less risk and less need for special equipment, than in the raising of table birds. There are about 150 head of Leghorn and Andalusian fowls, which are excellent layers, a few Wyandottes being kept for incubating and rearing purposes. The fowls run at large in the plantations of shelter trees near the homestead, and in some adjoining grass paddocks, finding roosts for themselves in the trees. There are also piggeries and the manure heap from the stables for them to visit, and mangels, beets, carrots, parsnips, and other vegetables are generally in the yard, being rejected from the market carts. The small herd of pure Jersey cattle kept upon the farm is a guarantee that the poultry receives a supply of skim-milk, and consequently a little grain for hard feed is all that is required to maintain good laying conditions. Mr. Morey has no doubt that the poultry pays, although at present no accurate account is kept. A few years ago, however, accounts were kept, and it was found that the profit was fully 10s. per week for the 12 months. After deducting all that had been paid for grain, the net income amounts to £26 per annum. The bulk of the food would have gone to waste but for the fowls, and the labour of feeding the birds and gathering the eggs was trifling. More fowls could no doubt have been kept, and larger returns obtained by giving greater attention to the business, but without making any special arrangements or interfering with the other work of the place, it made the addition mentioned to the general income.

"In the business of egg production the main object is to secure good laying results, while in breeding table birds there are the additional cares of profitable feeding, necessitating separate yards and equipment for the purpose. The matter of feeding has to be considered in relation to the kind and quantity of food that can be picked up on the runs. In Mr. Morey's case the absent element is hard feed, and hence wheat is added, with a little mixture of maize in winter. On many farms hard feed is plentiful about grain stacks or in stubble paddocks, and the addition of soft feed is necessary. In regard to the important matter of securing the production of winter eggs, it is essential, in addition to liberal feeding, to breed young pullets that will commence to lay just before the cold weather sets in. Broods hatched out at the end of September or early in October will be at the laying age, five months old, before the end of autumn or early in March.

Shelter is important, and the successful results in this case are no doubt largely due to the well-grown tree plantations which protect the homestead from cold winds. Another favourable condition for the poultry is the situation of the homestead upon a well-drained sandy loam.

"Important changes favourable to the poultry business have been taking place during recent years. In connection with egg production, cool storage has brought about a new situation, and the export trade is available wherever resort to it may become necessary. Several years ago trial shipments of eggs were sent to London. These eggs, which were graded and properly packed, met with a favourable reception, selling as fresh at 1s. 2d. and 1s. 4d. per dozen, as compared with 5d. in the local market at the time. The South African trade prevented this beginning from being followed up, and we have never since produced sufficient eggs to support exportation. On the contrary, we import considerable quantities of eggs every season, especially from South Australia. The cool storing system also has assisted to prevent production from reaching the exporting stage by increasing local consumption. A considerable portion of the summer surplus is now placed in cool storage and thus carried forward to assist in meeting the winter demand. A charge is made at the Government cool stores of 3d. per case for the first week, and 1½d. per case for succeeding weeks, and eggs stored when the market falls are brought out in April, May, and June, and sold at from 1s. to 14d. per dozen. When production comes to exceed the demands of the local markets, the surplus can be exported, as London will take any quantity at from 1s. to 1s. 3d. per dozen; while freight and other charges would amount to very little more than the existing cost of cool storage.

"The export trade in table poultry also awaits development. In some branches of agricultural production the great need is for markets. In connection with both eggs and poultry, the markets already exist. All that is necessary is to supply them. There has been a standing offer all through the season of 6d. per lb. for large quantities of birds that would pass inspection at the Government cool stores, but the number exported has been much less than in the previous season, when exports to the value of £35,000 were made. It is because producers do not feed their poultry with sufficient liberality or skill that such a small proportion of the birds are fit for export. Satisfactory improvements are taking place in the breed of our poultry, but the art of feeding, which is indispensable in connection with the export trade, is much at fault. Mr. Hart, the Government expert, recently imported some Surrey fowls as sent to market, in order to learn the cause of their high reputation, and the result was to confirm his opinion that we have plenty of good birds in Victoria, if we gave sufficient attention to feeding. Mr. Wyett, who has been successful in getting high prices during the past season, points out that there are special difficulties in the way of topping up for prime quality. While the local market is not over supplied the importance of the export trade is liable to be lost sight of; but the Agricultural Department would do well to direct special attention to those details of finishing or topping up, without which the future surplus of our poultry business will not be able to find an outlet in the British markets."

NARROGIN EXPERIMENTAL FARM.

By F. L. Faulkner.

March has passed this year without a break in the season. Last year only 22 points were registered for the corresponding month, but an early rain fell in April. This season our house-drinking water has had a very severe test with a large number of students, immigrants, and men engaged in clearing. We have a good month's supply.

The stock on the farm are practically all in good, strong condition, although we have little enough of feed to carry us through.

The new property lately acquired will greatly add to our stock-feeding capacity, and give us a good range of country. Unfortunately, however, it was all overrun with bush fires just prior to our taking charge, thus destroying a fine lot of good dry feed.

Sheep seem to suit our condition better than any other stock, and our little flock of 200 breeding ewes and 100 young sheep are looking very well indeed.

Cattle require better country than it has been our fortune to possess up to the present. They have fallen away considerably, the grass being too short and poor; however, with the new property added, I am convinced that we can keep cattle in good condition and health all through the year. Horses are all in good working condition. Three aged unbroken Suffolk Punch mares have been transferred from the Chapman State farm to this one. We have been feeding them into condition a little, prior to handling and converting them into plough horses.

Pigs are all in good strong condition, and we have a considerable number of porkers, slips, and weaners on hand. Orders can be fulfilled for a few very good pedigree boars or sows from eight weeks to three months old.

Mr. Robertson, the Poultry Expert, has now settled down and taken charge of the poultry on the farm. A nice lot of young stock are coming on, although we shall require most of the female stock to make up our flocks. The poultry pens are being moved to a more convenient and desirable position, and the job is now well under way. The change is proving very satisfactory indeed. We have a very fine lot of young turkey hens and gobblers for sale, and will be pleased to receive orders for same. The sire of all these was the first prize bird at the Royal Show at Claremont. A few very good type Toulon geese and Pekin ducks are now available.

During the month just passed orders for seed wheat have been very numerous, and I am very sorry to say we have had to refuse a very large number of applicants owing to the small areas for grain last season,

and also to the fact of our having a much larger area to crop this coming season. The summer crops on the farm have practically all been cut for green feed or for seed. Unfortunately, owing to the very wet season experienced last winter, nearly all the land that I had reserved for summer crop was unploughable almost up to the middle of November, consequently only a small proportion of what I had intended to devote to these crops was sown. The following is a list of the crops tried and the result:—

Maize.

Sown early in November on black loose sand, originally heavy red gum country, manured with about 2cwt. of superphosphate per acre; land previously carried potatoes.

1. *Ninety Day.*—A good quick growing variety; average growth about five feet; a good green feed variety, and cobbed well.

2. *White Dawn.*—Grew well and gave a good supply of green feed, but did not cob so well as Ninety Day, and was badly crossed with other sorts.

3. *Austin's Colossal.*—A good variety for green feed, and gives good cobs of great size, but requires plenty of moisture to cob well.

4. *Fink's Yellow Dent.*—Grew fairly, but did not cob well.

Sorghum, etc. (Sown and manured same as Maize).

1. *Sorghum Saccharatum.*—Grew up to 12 feet high, and gave (estimate) at least 25 tons per acre of green stuff. The stalk of this, right up to the time when the seed was in the dough state, was sweet and palatable, and relished by the stock.

2. *Broom Corn.*—Grew a very heavy, high crop of stuff, being up to 12 feet high in places. The stalk of it was very unpalatable to stock even when the plant was green. Ripened in January.

3. *Milo Maize.*—Grew up to eight feet high. A heavy cropper of heavy-leaved, luxurious foliage; late maturing, the seed being still unripened; as a feed, the leaf is good, but the stalk, even whilst green, is hard and fibrous, and devoid of any saccharine matter.

5. *Gold Cap.*—Did fairly, but seed was badly crossed with other varieties.

6. *Gold Flint.*—Grew fairly, but did not cob well; a fairly early variety.

7. *Hawkesbury Champion.*—Grew and cobbed well; a very good midsummer to early variety.

Most of the varieties of maize gave a good, tall growth, averaging five to six feet and up to 10 feet high, but the early quick-growing varieties grew and cobbed best.

4. Grew up to 7 feet high; earlier than milo but later than the saccharatum; midway also between Milo's maize and sorghum saccharatum as a food stuff.

5. *Giant Millet.*—A midseason millet, giving a dense growth of nice fine green feed 4 feet to 6 feet high.

6–7. *Red and White Millet.*—Two light short croppers, but very early and heavy seeders; a good millet for a quick crop, but ripens when other natural feed is still fairly plentiful.

8. *Mazagura.*—Apparently a sort of sorghum, but so far it has failed to flower or seed; a late grower and requiring earlier sowing; was a heavy crop of luxurious vegetation.

9. *Pearl Millet.*—A rather late maturing millet, but one giving a very abundant supply of dense palatable foliage; stock eat it readily.

CHAPMAN EXPERIMENTAL FARM.

By R. C. Baird.

The following is a report from the Manager of the Chapman Experimental Farm for the month of March:—

Ploughing, the principal work for this season of the year, has been pushed on. The ground is very hard, and the work is necessarily difficult. Very little ploughing is done in this district until the rains come, but as we intend to put a larger area under crop this year than formerly, it was necessary for us to make an early start.

No. 5A paddock, which was ringbarked three years ago, is now being cleared for cultivation. I hope to have it under crop this season.

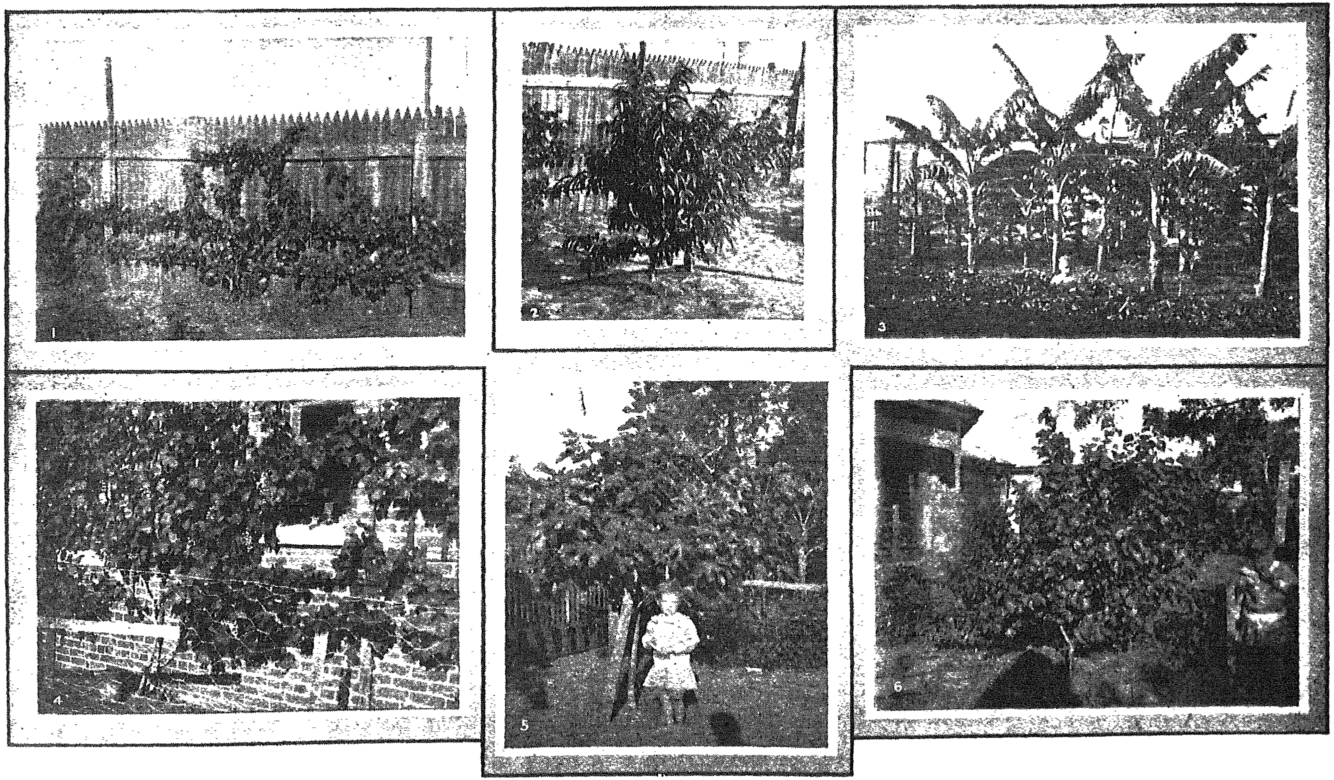
Boring for water has been carried out during the month. Several bores have been put down without much result. The ground we have been boring is exceedingly hard, and in consequence the progress is slow. Our object is to locate water in places convenient for stock and to serve two or more paddocks.

In several of the cultivation paddocks a strong growth of wattles came up after the crop had been taken off. These have been grubbed and the rubbish burned off.

Small plots of "early amber cane" and "broom corn," which were sown in August, are still green, and growing. These crops have been cut three times, the fodder being fed to the pigs and horses.

The "cowpeas" sown in September are still green, although owing to the total absence of rain they are not making much growth. The "whip-poor-will" variety is the most vigorous. A nice crop of peas have been gathered from this variety.

The stock on the farm are maintaining their condition, although feed in the paddock is getting scarce. The milch cows are being fed twice a day on stack ensilage, which they took to very readily.



GROWN IN THE SAND AT CLAREMONT. (See Letterpress).

GROWN IN THE SAND.

The following description of fruit trees and vines recently planted and grown by Mr. Alex. Crawford, at his residence, Claremont, will give an idea of what can be done with a little care and attention, in what is termed "the hungry sand around Perth."

Figure 1 is of a vine planted last June; it received a watering every three weeks during the summer, and was manured with two pounds of sulphate of potash with the same quantity of bone dust. A top dressing being made with stable manure.

Figure 2.—A peach tree planted in July of last year, treated in every way the same as the vine in figure 1.

Figure 3 shows a clump of sugar bananas only six months from time of planting. These were manured and watered the same as the vine and peach. In the foreground of this picture can be seen a crop of sweet potatoes; hardly anywhere in this State are finer sweet potatoes than those grown by Mr. Crawford, as well as other gentlemen in the same locality, to be seen.

Figure 4.—This splendid vine of muscatel grapes was planted as late as September, 1904. It was thought at the time that it would die, yet this year it has matured 70 fine bunches of grapes that would hold their own in any ordinary competition. The only manure used on this vine, in addition to that used on the previously described three, was one pound of nitrate of soda.

Figure 5 is of a specimen of the "Brown Turkey" fig, planted at the same time as the last vine, viz., September, 1904. It has grown to a height of over nine feet, and matured two hundred and odd figs. The treatment received was the same as that given to the muscatel and bananas.

Figure 6.—A fine young apricot tree, planted in August, 1904, treated the same way as the last described, and maturing a number of fine, large, well-formed fruit.

Mr. Crawford is to be complimented on his happy idea of thus supplying such a forcible object lesson to those who have been looking at our sand patches as being no good for anything. Even down the coast line, we hear of settlers having met with more than ordinary success in growing wheat on similar sandy lands. Such reports must lead to further efforts, and the hitherto much dispised sand may yet be sought for in order to produce special crops. Certainly, so far as the photos given of the trees grown by Mr. Crawford shows, that fruit at least can be grown, and grown well, by anyone giving the time and attention to it.

THE WHEAT CROP.

HINTS FOR BEGINNERS.

By Percy G. Wicken.

The following are a few simple notes on the cultivation of the wheat crop, and are suituable for beginners who have started farming operations without any previous experience, and who are so situated that they are not in a position to obtain information by attending lectures or by visiting larger farms where wheat cultivation is carried out on a large scale. From my observations in travelling about the country, I have come to the conclusion that a few such notes would prove acceptable to many.

Preparing the Land.—The land should be ploughed to an even depth of not less than four inches, and then well harrowed. If sufficient land is available, it will always be best to fallow the land the season before sowing, and then scarify it before sowing. But as these notes are written especially for beginners, not many are likely to have fallow land; beginners have to sow it as soon as they can get it cleared.

Fertiliser.—Seed and fertiliser should be drilled in together.

The quantity of fertiliser to be used must depend very largely on the quality of the soil, and will vary from 56lbs. to the acre upwards. Superphosphate will prove the best fertiliser to use in the first instance on new land, but for subsequent crops on the same land, a more complete fertiliser should be used. If after the winter rains begin to drain off the ground, the crop looks yellow and sickly, a top dressing of nitrate of soda, applied at the rate of half a hundredweight to the acre, will generally improve the crop. This should be broadcasted over the crop just before a shower of rain is likely to fall, which will carry the nitrate into the ground and make it immediately available for plant food; it is very little use to spread it after the dry weather sets in.

Time to Sow.—The best time to sow wheat in our Eastern districts is from April 1st until the middle of May, but experience tells us that, at any rate in the drier districts, the early-sown crops almost invariably give the best results. Those who have fallow land can begin to sow early in April, and the wheat will lay in the ground until sufficient moisture falls to enable the seed to germinate.

The quantity of seed to sow varies according to the variety of the wheat, the nature of the soil, and the period of sowing. Theoretically, a few pounds of seed will be sufficient for an acre, provided the seed could be put in by hand and at stated distances apart; but as this is not practical on a large scale, we have to sow by means of the seed drill. Under these circumstances, about one bushel per acre is the best quantity to sow as an average. As a general rule, with a good stooling variety of wheat, it is a good plan to start on 1st April, sowing at the rate of 45lbs. of seed to the acre, increasing this quantity 5lbs. per acre per week as the season advances. All slow-growing varieties, known as late wheats, should be sown early in

the season: the quicker-growing varieties being left until later in the season, as they mature quicker and occupy the ground for a much shorter period of time.

Some of the very quick-growing varieties, such as the Allora Spring and Early Para, can be sown in the spring in the moister districts with every hope of success; in fact, in some parts of the State, excellent returns have been obtained from these varieties sown early in August.

Depth of the Seed.—Seed should be sown at as even a depth as possible. If sown at irregular depths the crop comes up unevenly, and the plants from seed planted too deeply never give satisfactory results. Wheat should not be planted at a less depth than an inch and not more than three inches below the surface, consequently we require the surface soil to be worked up finely to enable the seed to be sown evenly and also to prevent lumps or clods covering the young plants. To obtain this even surface, or, as it is called, a fine tilth, it is necessary to harrow and roll the ground before sowing. All experiments carried out on the subject prove that wheat drilled in gives better results than that sown broadcast. In the first place, there is a great saving of seed, and the grain being planted at regular distances apart allows each plant sufficient room to develop, while seed sown broadcast, however well it may be sown, is more or less uneven, and some plants have plenty of space in which to develop, while others are cramped close together and have not room to develop. The wheat plant will, if allowed the opportunity, stool or tiller out to a great extent, as many instances of over 100 stalks from one seed have been recorded, but this is only likely to occur in well-manured land and where other conditions are favourable. Sown by hand at stated distances apart, and in rows so that each plant can be cultivated round, some wonderful results have been obtained; but these are, of course, impossible in field cultivation.

Seed.—It will always be found profitable to obtain the best seed wheat. All seed should be thoroughly graded and all weed seed, broken and shrivelled grains, taken out. "Like produces like" is a saying applicable to plant production as well as stock raising, and if first-class grain is required, first-class seed must be sown. In many instances, farmers reserve for seed purposes such grain as they cannot sell. Such grain can never produce a good crop. It would be found much more profitable to turn such grain into bacon, and to obtain good seed from someone who takes the trouble to grade it for seed purposes. Such seed will, of course, demand a higher price, owing to the cost of grading and handling, but it will be found cheaper in the long run, and even if a smaller quantity is sown, the improvement in the crop will more than compensate for the expenditure. Up to the present time any quality of wheat has been able to find a buyer, and very little distinction in price has been made between good and bad samples; but these days are past, and are not likely to return. As the supplies of wheat become more plentiful the miller or merchant will only buy the best samples, and those who produce poor and inferior classes of grain will find increasing difficulty in disposing of them. There is also a great difference in the milling qualities of grain, and although in the past millers have been glad to accept anything in the shape of wheat, they will, in the future, only buy such varieties of grain as will give the best results when turned into flour. Next season we shall probably be exporting a considerable quantity of wheat, and in this case again it will be only the best grain that will be able to be handled at a profit. It, therefore, is important that all settlers should pay particular attention to their seed wheat.

Steeping the Seed.—All kinds of grain seed should be steeped before being sown, as it has been proved over and over again that steeping the seed before sowing will, in a great measure, if not altogether, prevent the crop being attacked by smut or bunt. This is a disease that attacks the ears of grain in the field and causes them to turn into a small sooty ball which goes to powder when dry, and not only causes a serious loss in the yield per acre obtained from the crop, but when mixed with the other grain considerably deteriorates its value both for milling purposes and also as a stock food. Chaff made from smutty wheat is also said to have a detrimental effect on stock. There is very little excuse for anyone having a crop of grain badly attacked by smut, as it is one of those diseases which can be easily prevented. There are two methods for treating the grain to prevent smut. These are known as the hot water and the bluestone methods. The first consists in steeping the grain for a few minutes in water at a temperature of 130°, but practical tests have shown that this method is not nearly so effective as the bluestone; and, owing to the difficulty in keeping the water at the exact temperature, this method is not much used.

The bluestone method is carried out as follows:—Obtain a hogshead and fill it three-parts full of water; for every five gallons of water 1lb. of bluestone is required; the bluestone may be dissolved by tieing it up in a bag and suspending it from a stick laid across the barrel so that it hangs about half-way down the barrel and is covered with water, it will take some time to dissolve, but if required in a hurry the bluestone may be dissolved in a small quantity of boiling water and poured into the barrel. A small pulley-block should be erected over the barrel for convenience in lifting the wheat. The method generally adopted is to divide a bag of wheat into two parts, tie the bags loosely, and immerse for about five minutes in the bluestone solution; the bag is then lifted by means of the pulley-block and allowed to drain for a few minutes, and then the grain is turned out to dry. Care must be taken that the liquid is allowed to penetrate into the centre of the bag, and if the bag is tied up too tight the grain in the centre will be found to be quite dry. A better method is to obtain a wickerwork basket that will hold about one bushel of wheat when about three-parts full; one bushel of wheat can be placed in this and lowered into the liquid; then take hold of the handles and swirl the basket round a few times; this will enable the liquid to penetrate right through the grain, and also has the advantage that it will allow all perished and shrivelled grains, light weed seeds, etc., to float to the top, from where they can be easily skimmed off. When the liquid has penetrated through the grain, the basket can be lifted out and placed on two pieces of batten laid across the barrel until the liquid has drained off. If two barrels are worked by one man, a large quantity of wheat can be treated in a day. Many other methods are in vogue, such as spreading the grain over the floor and applying the bluestone solution with a watering can; but they cannot be recommended, as they cannot be depended on to reach all the grains, and unless the treatment is thoroughly carried out it may as well be left alone. Bluestone only costs a few pence per pound, and there should be no excuse for anyone growing a smutty crop of wheat. Bluestone, which is sulphate of copper, is very similar in appearance to sulphate of iron, which is very much cheaper, and is often sold to the farmer in place of bluestone, and accounts for many failures which cannot be accounted for otherwise. The difference between bluestone and sulphate of iron is very considerable. Bluestone, or sulphate of copper, is worth about £25 a ton, whereas sulphate of iron, which is known as copperas, is only worth about as

many shillings; hence the temptation to unscrupulous dealers to substitute one for the other. The colour of sulphate of copper is a deep blue, and that of sulphate of iron a pea green; but as the two get mixed the colours become very similar. The most simple method of testing bluestone is to dissolve a small portion in a bottle of water, and when dissolved put in the blade of a clean knife or a new nail. If it is copper the part which was in the solution will have a bright coating of copper; if it is sulphate of iron, it will only have a black stain. Sulphate of iron, or copperas, is absolutely useless for steeping wheat or as an insecticide.

Rolling the Crop.—After the seed is sown it is an advantage to run a light roller over the crop. If the ground is at all light, this helps to consolidate it and gives the seed a better opportunity to germinate; it breaks up the lumps which may otherwise lay on top of the seed and cause the young shoots to be misformed, or perhaps choke them out altogether. Apart from this, it also levels the ground and gives the harvesting machinery a much better chance of doing good work than when it has to pass over uneven and lumpy ground. If the rolling cannot be done after sowing, it can be carried out when the crop is from six to nine inches high with satisfactory results, provided the ground does not become too wet: when once the ground becomes thoroughly wet the rolling is best left undone.

POISON PLANTS.

THE EFFECTS ON STOCK.

The Director of Agriculture has received from the Government Analyst (Mr. E. A. Mann) an instructive report on the subject of an antidote for the effects on stock of poisonous plants. Mr. Mann's report states:—

"Early in January last I reported to you certain experiments made at Narrogin with antidotes for poisoning by the York-road poison plant. The account of these experiments was published in the *Agricultural Journal* of January and in the daily press, and attracted the attention of a few owners of stock who had been troubled by the effect of this and other native poison plants. In consequence I received four applications from various parts of the State for supplies of antidotes for experimental use. I accordingly had sets made up, with clear instructions for use, and sent out in all eight of these sets. Two alternative methods have been suggested, in which the principal agents employed are tannic acid and permanganate of potash respectively, and for the sake of brevity I will speak of them as the tannic and permanganate methods. So far I have received only one report of trials, but this is of such interest that I should like to call your attention to it.

"On 7th February last I received a letter from Mr. Herbert E. Spencer, Daudling, on the Darkan Area, where poison plants abound (especially the York-road), asking for a supply of material. He stated in his letter that the loss of stock was a most serious matter amongst his neighbours, and he himself had lost 24 ewes during the month of January alone. In this letter Mr. Spencer showed a very keen and intelligent interest in the matter, and described the method of treatment generally employed by the settlers, viz., bleeding under the eye to relieve the brain. He said that if the blood was so coagulated as not to flow readily the animal generally died; but the method does not appear to have been very successful, as the greater proportion of those so treated died. He also accurately described post-mortem appearances similar to those which I had observed in my own experiments. After the appearance of my report, Mr. Spencer said he had tried the permanganate on six sheep, and they had all recovered.

"In reply to this very interesting letter, I sent Mr. Spencer a supply of remedies on 16th February, and have just received a report from him of his tests, dated 20th March. In this letter he describes five trials, the first two with the tannic and the last three with the permanganate treatment, all between 16th and 23rd February. The first two were unsuccessful, and I have in consequence suggested modifications of the tannic treatment when trying it again. The last three cases were quite successful, and I quote Mr. Spencer's own words:—'I then determined to use in future the permanganate of potash, and to me the result is highly satisfactory. I had no sulphate of alumina (one of the substances employed in the permanganate treatment) then, so I used in one case a little vinegar and in the rest tartaric acid; later the same day, 18-2-06, Shropshire-Lincoln ewe, and both showed signs of poison. Seven p.m. gave vinegar weak solution; 7·3 gave permanganate, no signs; made her comfortable, and as nothing transpired, left her. 8·30 p.m., sheep comfortable; 5 a.m., 19-2-06, sheep feeding, and she has continued well. 20-2-06, cross-bred ewe, broken mouth, very old, bad case; 10·5 a.m. gave tartaric acid, weak solution. 10·8 gave permanganate solution, and left her. 8·30, no apparent change, sheep breathing stertorously; 21-2-06, 2·15 p.m., sheep recovering; next morning she was feeding comfortably enough. 23-2-06, Shropshire-Merino ewe discovered about one mile from home in violent fit. Went home and powdered remedies and returned; 3 p.m. sheep in state of coma, evidently dying; gave tartaric acid. 3·3 p.m. gave permanganate of potash; no apparent result; made incision in nose both sides; blood black and thick, too thick to flow. I could not make it flow, so I made her as comfortable as I could against a log and left her, fully expecting her to die; returned at about 4·30 p.m., and she had opened her eyes, and was apparently resting comfortably; 24-2-06, 5 a.m., she was evidently recovering and resting comfortably; 5 p.m. she started feeding, and has remained well ever since. This, I consider, a severe test, and, to me, a good win for the permanganate.'

"I think you will agree that these tests speak remarkably well for the suggested treatment. One settler (who in two months had had at least 35 sheep poisoned) has been able to save nine animals by the permanganate method, *i.e.*, every animal treated by the method. The remedy has evidently been a practical one, capable of application under working conditions, and has proved efficacious even in extreme cases. The facts here given, if supported by further experiments, will effectually dispose of the two principal objections which have been raised by my critics, viz., that the method was impracticable under the ordinary conditions

of stock management, and that when animals showed signs of poisoning it was then too late to apply a remedy. I hope to make extensive use of the valuable assistance of Mr. Spencer in further testing the treatment, and hope that his success so far will lead others also to make experiments. I will be glad to answer any inquiries or to supply packets of the remedies to anyone who would like to try them."

LAMB-BREEDING.

For some months past efforts have been made by writers in the *Journal* to create an interest in lamb-breeding amongst our farmers for local market and export. That the efforts so made are bearing fruit is borne out by the fact that early in the present month the president of the Northam Agricultural Society, Mr. T. H. Wilding, read the following interesting paper on "Raising Fat Lambs for Market":—

"There is no industry in connection with farming more profitable at the present time, or likely to be in the future, than the raising of fat lambs for the market. Up to the present time we have had a ready sale locally at from 9s. to 14s. per head. These lambs, in Adelaide, according to weights and the prices for the English market, would have been worth from 11s. to 16s. So you will see that we have not been receiving value in the past.

"There are already inquiries being made for a shipment of 2,000 lambs as a trial consignment from Western Australia for the English market, and it will be to our interests to each supply a given number to make up the necessary shipment. We are a week nearer the English market, where there is an unlimited demand, than the other States. Our Eastern districts being so suitable and well adapted for the raising of fat lambs, every farmer should be a producer. Even the small man, with his 160 acres, should have at least his 20 ewes, and they ought to give him a return of £1 per head per year, and he would still have his ewes. If he will fence off two 10-acre paddocks, fallow one up and sow it in March with about 6lb. of rape and half a bushel of barley per acre, on sandy loam, four weeks after rain, he will have feed capable of carrying two sheep to the acre, and in two months five sheep to the acre, until the end of November, when they could be removed into the other paddocks, which could be sown down in September with cowpea for summer feed. This, together with the stubble, would carry the sheep. The small farmers should not have fallow land lying idle, but should be producing melons, sorghum, and other suitable summer crops for stock.

"To give an instance of the returns that might be expected: last year, from a flock of 830 ewes, I sold 800 lambs at 14s. per head on the rail.

The ewes cut me an average of 7lb. of wool, worth 10d. per pound. So you see they gave me, practically, a return of £1 per head. This was done on natural pasture, and can be very much improved on by a rotation of crops.

"The best class of ewe for a quick return is undoubtedly a cross between the Lincoln and merino, mated with the Shropshire ram. The lambs, at three months and a half old, should average from 30lb. to 35lb. The best quality of lamb will be obtained from a cross between a Shropshire ram and a merino ewe, but it will take from three to four weeks longer to grow them the weight of the former, and the early lamb is the one that brings the best prices locally. The lamb being taken from the ewe early, enables her to have a good rest and get thoroughly strong and fat and suitable next season for breeding again.

"One of the most important points is not to overstock—rather under than over, as it is better to have 500 lambs worth 14s. per head than 800 only worth 9s. To develop this industry successfully it will be necessary to have freezing works, and Northam being so central it would be the most suitable place for them to be established. After the carcases are frozen they could be loaded in trucks and taken to the ship's side, as we want to avoid handling to keep down expenses. If we are alive to our own interests it should not be long before we have this industry in full swing."

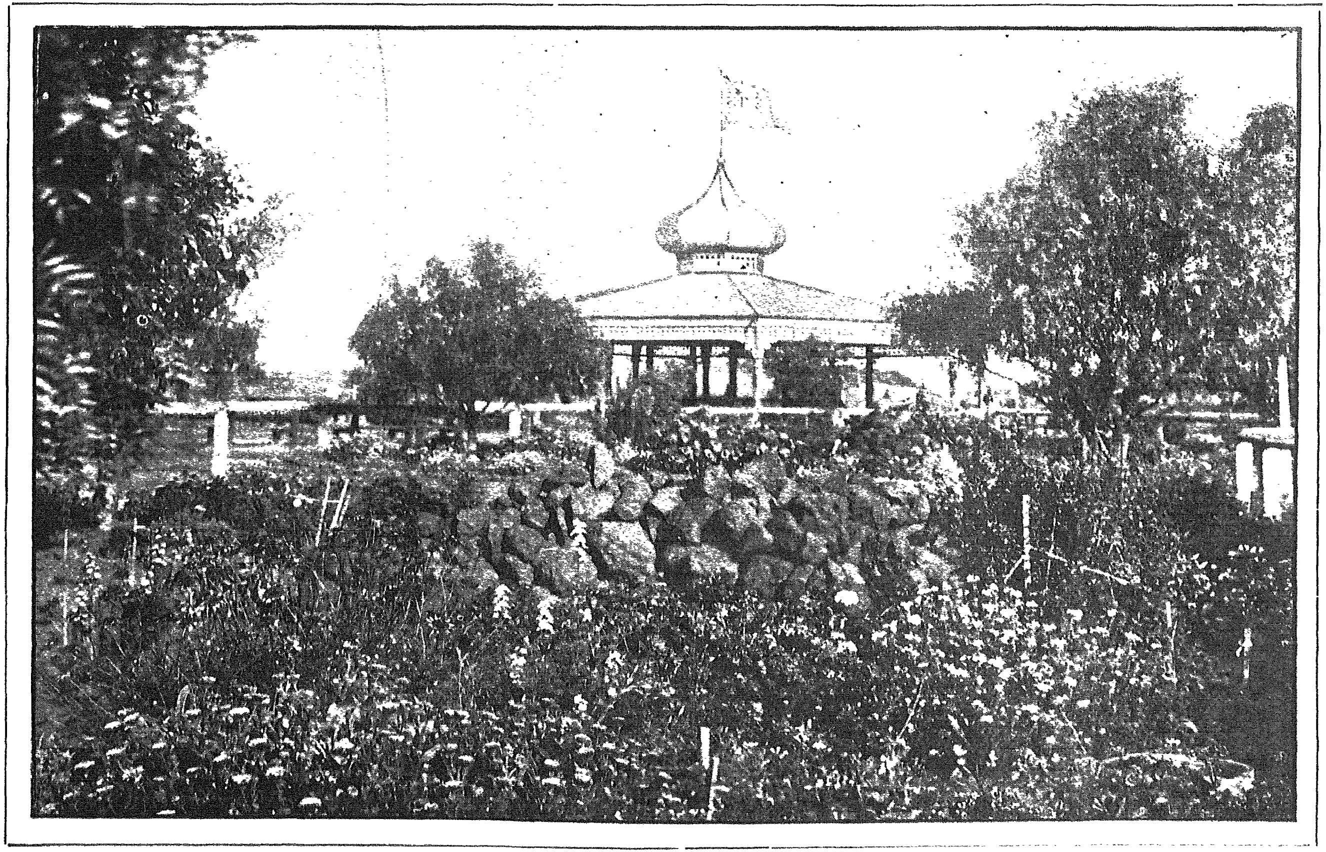
At the conclusion of his paper Mr. Wilding drew attention to the urgent necessity for action on the part of the Government in the direction of discouraging settlers from going too far east for agricultural purposes. A line should be marked out beyond which the land should be available under suitable terms for grazing, and in that way a great stimulus would be given to the sheep-breeding industry.

DAIRY COWS AND THEIR PROPER FOOD.

By J. T. Nundy.

Having decided on starting a dairy farm, and having chosen suitable land, the first consideration is, What are the most suitable crops to grow for use during the different seasons, and what to grow to store by for use during the hot summer weather? I am supposing the farm is situated on land that will not grow suitable grasses for a dairy herd and keep green through the summer.

It has been said over and over again to the writer, since his arrival in Western Australia, that it is impossible to make a dairy pay where you have to grow food specially for the cows, and where there is not natural grass all the year round. I personally cannot see this, provided you have suitable



Victoria Park, Kalgoorlie.

arable land; and on most farms there are patches which are adapted for growing fodder, and these could be reserved. Why I think it is possible is for this reason: Knowing, as I do, the large number of large dairy farms there are all over England, and the large number of cows kept in towns by dairymen who have to buy all the forage for their cows, which are entirely hand fed, and yet these men manage to live well and save money; if you consider the long winter there, from beginning of October to end of April and often well into May, during which time all dairy cows have to be hand fed on dry food that has been specially grown and preserved for them—this being so, my contention is you have only to reverse the conditions, and here in Western Australia the cows would have to be hand fed during the hot summer weather instead of, as in England, during the long cold winter. I can't help thinking that you have a decided advantage in your beautiful climate. I wonder the cows are not kept in the house during the hot summer days and well fed during the day, with plenty of clean sweet water to drink at will, and turned out in the cool of the evening. I notice the cows when they are turned out here do not graze but stand under a tree, if there is one, or any shade they can find, waiting until it is feeding and milking time again. I feel sure if this plan was adopted the returns in milk would be much greater. The mainstay for summer feeding is, in my opinion, ensilage made from properly grown crops on suitable land. In England, on all the large farms on which irrigation is practised and very heavy crops are grown, the ensilage is not made in silos but in stacks, mostly in the fields in which it is grown; this plan is found to be much quicker, and the ensilage is sweeter than in silos, and goes into much smaller compass, and is readier carted than the greenstuff, and can be cut into squares with a hay knife and very easily handled. This plan does away with all special and expensive plant or buildings, and the product is, in my opinion, much sweeter than that made in pits. The tops are in some cases covered with about 12 inches of earth, and in others thickly covered with hedge and ditch trimmings. In some cases they are thatched if required to stand through the winter's snow and rain. Against this plan may be raised the question of waste at the sides, but this is very small, and would be less in this climate than at home, and nothing as compared with the interest on cost of silo and repairs. I think the best ensilage could be made here by sowing a mixture of oats, barley, maize, rape, Italian rye grass, and vetches. This crop would stand up and yield a very heavy crop, and if cut at the proper time would make beautiful sweet ensilage. In making the stack I think it would improve the flavour if at certain intervals layers of barley (for choice) or oat straw was used, also about every yard in depth a good sprinkling of common salt was spread; it gives it a much pleasanter smell and taste. The stack ought to be broad and fairly high, and great care must be used to carry it up evenly and well tread it, so that there are no hollow spaces for the air to collect in, or one part shrunk more than the other; when required for use it could be cut with a hay knife into squares, and thus be easy to handle and cart. Another crop that I think would do well on suitable land is Italian rye grass and English red clover. I know it does well and cuts a heavy crop on light loam and sandy land in England, and if it could be grown here, and made into hay as is done there, and carted into the stackyard and made into a stack, and being through a good fermentation, it would make a grand fodder either alone or, as is usually done, cut into chaff and mixed with other food stuffs. The rye grass grows about 3 feet high, and if cut just when the seeds set, but before they are ripe, is as good as corn, as it carries a very heavy head of seed,

which the cattle eat very greedily; and in England it grows a second crop of clover, called the "aftermath," in about six weeks, which can either be eaten off on the land or given as green food to the cattle and horses. I should like to see an experiment made to try to grow this crop, and I think there ought to be some suitable land on one of the Government experimental farms, but the greatest care would be required in selecting the seed, and to give it a fair trial the seed ought to be got direct from England, from reliable seedsmen. They would be in a position to select the seed most suitable for the class of land and climate; you would then be sure of getting *new* seed, and not old stock held by agents here, half of which would not grow. For another summer food mangolds ought to be grown, and at proper time taken up and carted into the yard and made into graves—that is, long rows, broad at the bottom and gradually going to a point at the top, which would be six or seven feet high; they then ought to be well covered with straw, and earth put on the top of that 12 or 14 inches deep, so as to keep out all air and wind. Before being carted into the yard they would require to be well cleaned, that is, all the earth carefully cleaned off and the root and top cut off. I feel sure that large crops of mangolds could be grown in Western Australia on selected spots, and when they are pulped and mixed with other foodstuff the cows greatly improve in their milk yield and keep in good condition. There are also several native crops that could be grown to cut green and chop up to mix with the other food even in summer. I should also like to see tried, to test if it would stand the climate, a mixture of English rye grass and white clover; if this could be grown it would make an excellent grazing paddock for young calves, and is largely used to sow for grazing with sheep and young stock in England. Great care would be required in preparing the land for these crops; it would want working and cleaning as if for corn, only not ploughed so deeply, except for mangolds, when it ought to be ploughed a good six inches deep, well worked and cleaned, then ridged, and if good farmyard manure cannot be procured, the most suitable artificial manure ought to be sown between the ridges; the ridges then ought to be closed over the manure, a light roller then run over the ridges same way as made. The seed ought to be sown by a drill that will sow it and more artificial manure together; it ought to take two rows at once, and be drawn by one horse, so that the ridges may not be knocked about. Fixed to the drill coulter, at the back, ought to be a small fork, two prongs, just a little wider than the coulter, to lightly cover over the seed with fine mould. After the drill the light roller ought to be run over again; this will press the ridges nearly flat and make them firm. On no account ought harrows to be used after the drill, however light, as the teeth are found to push the seed away from the manure, and so cause the young plant to lose the benefit of the manure. The reason a certain portion of the artificial manure is sown with the seed is that the young plant may, as soon as it strikes, find nourishment until they are strong enough to reach the lower manure. As soon as the plants are strong enough they ought to be struck out with a hoe 14 inches wide. This is done by going across the rows and drawing the hoe across the row not too deeply, and pulling out the plants, leaving them between the rows. With a little practice a man can do this nearly as fast as he can walk. After a day or two the rows will want to be gone carefully over, and all the plants except the stronger ones pulled out by hand, leaving the one which would thus be 14 inch each way from the next plant. Then, again, all the wheat and barley chaff ought to be carefully stored in a dry place; either make a splendid addition mixed with the other food, and the cows are very

fond of them. Another crop that could easily be grown is cow-cabbages, and gives heavy crops, and when cut up and mixed along with other food makes it sweet and juicy. They are also largely given to the cows whole in the fields, simply pulled up and carted into the field and thrown broadcast for the cows to eat, which they do greedily. All the food ought to be cut into chaff, the roots pulped and well mixed, and spread layer over layer, then turned three or four times to ensure it is thoroughly well mixed; then it ought to be covered over and left for at least 12 hours before use to be able to set up a good fermentation. If a good proportion of ensilage is cut up the cows will milk and rest well. Where no cake is used maize and pollard ought to be given in its place, the maize ought to be in the form of flour, or split very finely. If the latter, it ought to be soaked in warm water some hours before use. Some people steam the food after mixing, but it is found at home that better results are obtained by setting up a natural fermentation; the food is sweeter, and not so insipid.

For the winter months the cows will require a feed of good nourishing and warmth-giving food before being turned out. This could be done by giving more maize, best bran, and some cake, and knock off nearly all the mangolds. As the fresh grass ought to force the milk sufficiently, no hard and fast rule can be given as to the quantity that ought to be given per cow. It varies according to the breed and size of the cow and the available food obtainable out of doors; when the cows are entirely hand fed, up to 60lbs. per day per cow can be given with advantage; the general run is from 45 to 60lbs. per cow. The cows must have plenty of clean, sweet water to drink; as much as they like and as often. Stagnant or dirty water ought on no account to be given, as it affects the quality of the milk. It is a well-known fact that the more pure water a cow has to drink the more milk she gives. Another thing that I would like to impress upon the attendant is this, and I consider it very important, the quieter and more contented a cow is kept the more milk she will give. Any excitement materially affects the yield of milk. Therefore the attendant ought to be a quiet, even-tempered man, and fond of animals; one who, if a cow kicks him, would not knock her about, as is so often done. Cows require gentle, quiet, regular treatment, and if possible always fed and milked by the same man, and at regular hours.

THE FIXATION OF NITROGEN.

A lecture was recently delivered at the Royal Institution by Professor Sylvanus Thompson, whose subject was the "Electric Production of Nitrates from the Atmosphere." The Duke of Northumberland was in the Chair.

Professor Thompson began by emphasising the enormous practical importance of the question in connection with the wheat supply of the world. The demand for wheat by the white races increased every year with the increase of population. But the acreage of land devoted to wheat-growing did not increase at an equal rate, and in any case, being limited by climatic conditions, would all be taken up in a comparatively small number of years,

perhaps less than 30. When that condition of affairs was reached, there must be a wheat famine, unless, as Sir Wm. Crooks pointed out to the British Association in 1898, the world's yield per acre (at present about 12·7 bushels) could be increased by the use of fertilisers. Wheat required some fertiliser containing fixed nitrogen, and the chief substance of the kind now available was nitrate of soda, obtained from the nitrate beds of Chili. The demand for this had practically doubled since 1890, and in 1905 was over a million and a-half tons; and at the present rate of consumption the supply would be exhausted in less than 50 years. Then the only chance of averting starvation from the races, for which wheat was the staple food, would be, as Crooks pointed out, through the laboratory; through chemists discovering some method by which, at a sufficiently cheap rate, the free nitrogen of the atmosphere could be fixed in a form which could be utilised by the wheat plant.

Cavendish, 120 years ago, had shown that the nitrogen and oxygen of the air could be made to enter into combination with each other by the action of the electric spark; but this early laboratory experiment undoubtedly pointed a way which might lead to a method of securing an artificial supply of fixed nitrogen. Many investigators had attempted the practical solution of the problem in vain. One difficulty was that the yield of oxidised nitrogen obtained from air by the electric discharge was very small; the reaction was reversible, and the nitrogen oxides formed were in turn split up by the sparks into free oxygen and nitrogen as soon as they were present in any quantity. But if the operation were conducted at a high temperature, a considerably larger percentage of oxides had to be present before this reversed action took place, and, further, the formation of those oxides were rendered more rapid. These facts were utilised in the process of Birkeland and Eyde, of Christiania, who made use of a special electric furnace. In this, an alternating electric arc was produced at between 3,000 and 4,000 volts, and was formed between the poles of an electro-magnet which forced it to take the shape of a disc of roaring flame four or five feet in diameter. Ordinary air was blown through the furnace, and emerged charged with nitrous fumes; the rapidity with which the product was removed from the sphere of operations being an important element. The nitrous fumes were collected, allowed time to oxidise, and then absorbed in water towers or in quicklime.

Experiments showed that the nitrate of lime produced was as good as Chili saltpetre. The conditions in Norway were exceptionally good for furnishing cheap electric power. The cost of the factory now in operation at Notodden was less than one-tenth of a penny per unit, and when further extensions had been carried out it was expected it would be reduced to about one-fortieth of a penny, hence the new "Norwegian Saltpetre" could compete with the imported saltpetre from Chili, and would every year become more valuable as the demand for nitrates increased, and the natural supplies became exhausted.

The lecture was illustrated by a large number of slides illustrating the Birkeland-Eyde factory at Notodden, and the research station near Arendal; and the peculiar form of electric discharge used was shown by a model apparatus sent from Christiania.

SAVING CALIFORNIA'S FRUIT CROPS.

NATURAL ENEMIES AT WORK.

CALIFORNIA AND WESTERN AUSTRALIA CO-OPERATING.

FUMIGATION AND SPRAYING NOT NEGLECTED.

In the *Century Magazine* for February appears an interesting article by W. S. Harwood, entitled "Saving California's Fruit Crops." It is freely and excellently illustrated, and will prove of special interest to Western Australian readers, because in it the work of Mr. Compère, the joint collecting agent of the Western Australian Department of Agriculture and the California State Commission of Horticulture, is referred to in complimentary terms. In the article it will be noticed that Mr. Harwood gives the whole credit of the initiative of the "natural enemy" or, as it is known in this State, the "parasite theory," to the California Commissioner of Horticulture. The editor of the *Century*, however, attaches a footnote in which he says, "It is proper to call attention to the fact that the initiative in the experiments described in the foregoing article, and the respective participation in them, are matters in dispute between the California Commission of Horticulture and the United States Department of Agriculture."

It will probably continue to be a matter of dispute as long as those participating in the original work are alive, but when the historian with judicial mind sums up the evidence, it will be found that the credit must be fairly divided between Californian workers, the United States Department of Agriculture, the late Mr. Fraser S. Crawford, of Adelaide, and the United States Commissioners of the 1888 Melbourne Exhibition. It is a pity that people actually in accord waste energy in dispute over details; but such is human nature.

AN ORANGE TREE GOES A JOURNEY.

Mr. W. S. Harwood says:—

A few months ago I saw in an office in the city of San Francisco a little orange tree about to set out upon what I presume was the most remarkable journey an orange tree ever made. It was growing in a wooden box, the whole tree being not more than four feet in height. It was to be enclosed in a strong redwood case, with openings to allow it breathing-space.

The little tree was bound for a far interior point in China. It would probably spend three months on its journey, would stay some time in China, far from the beaten paths of the tourists, and then would begin its homeward journey to San Francisco. Curiously enough, the tree was starting out for China to be cured of a disease. It, in common with a number of

other California orange trees, had broken out with a most wretched affliction which was rapidly destroying its glossy green leaves and unfitting it for service. The disease took the form of a tiny insect or scale growth called Depidosaphes Beckii, very small in its individuals, but many in the aggregate, and very dangerous. In fact, if the disease should not be checked, it would be likely to do irreparable damage to a great fruit industry.

To Meet Mr. Compere.

In China the tree would meet a man (Mr. Compère) who has made a lifelong study of plant diseases and injurious insects. He spends his time travelling over the world searching for the foes of these pernicious insects. He knows that there is a foe for nearly every one, and it is his business to find that foe. One month he may be in West Australia—which country helps pay his expenses—another month may see him in Japan, or in India, or Spain, or Siberia. It is a well-known fact that whilst almost every insect pest has its enemies, the enemies and the pest are evenly matched where the conditions are normal. and no harm is done. When the balance is not maintained the pest gets the upper hand.

Then comes the need of the searcher of pest foes. It is exceedingly difficult sometimes to find the region of the world where the foe exists. It was learned in a roundabout way, for example, that in an interior Chinese province this pest of the California orange tree lived side by side with a tiny insect that was an enemy to it. The pest and the destroying insect developed in about equal numbers, so that the balance was preserved and the pest did no harm. The object in sending the little orange tree on its long journey was to take it into the locality where the pest and the insect both live, allow the destroying insect to lay its eggs upon the leaves of the tree, as it always does when it finds a place where its prey is living, send the tree home again with the eggs of the foe upon it, hatch them out in San Francisco, and then send the spiteful little insect out into the infected orange regions to destroy the pest that threatens the orange industry.

Two States Co-operate.

This is an illustration of the functions of a remarkable enterprise, now being carried on under the supervision of the California Commissioner of Horticulture. The way has now been opened for a revolution in the methods of insect-pest treatment. The Commission, which is a State Board, has been quietly at work upon the problem for ten years. It has demonstrated by actual tests that the only permanently successful way of combating pests in plants, whether fruit trees, vegetables, or grains, is either to stamp out the disease altogether, usually a practical impossibility, or to introduce into the region where the pest exists its natural foe. The balance of nature is absolute. The moment an insect pest gets in the ascendency and begins to be a destroyer, this balance is disturbed, and at that moment, if possible, the foe should be at hand. It is sure to exist somewhere—nature's provision against over-production. When unrestricted production goes on in plant or animal life no one can predict the result.

How the Work Pays.

So the work of this Commission is not a fad, but a practical and immensely valuable enterprise, already resulting in the saving of millions of

dollars to the fruit industry of California. The saving, when the experiment is a success, is two-fold; first, it puts a check upon the disease or pest, thus saving the crops; and, secondly, it does away with the need of elaborate and expensive spraying outfits.

Codlin Moth Parasite.

A year or so ago Mr. Compère found in Spain a region where the Codlin moth lived, but where the ravages of the worm, to which its eggs gave birth, were slight. Investigations were made into this curious state of affairs. The result was that he discovered an insect, an ichneumon-fly in form, though not at all like the ordinary house-fly, the sole aim in life of which was to kill the worm. The fly was about five-eighths of an inch in length, with a slender wasp-like body, and two pairs of blue-black wings. It was equipped with a curious stiletto-like sting, about as long as itself, which it could project from a sheath, and then, by bringing the full force of its powerful body in play, could drive down into the bark of the tree where the worm was found, and kill it, much as a woodpecker performs its grubbing feat.

It was reasoned that if this parasite, or foe insect, kept the Codlin moth down to a proper balance in Spain, it could do so in California. The ravages of this moth have been enormous. It hatches out an egg which produces a worm that destroys vast quantities of apples; indeed, its ravages have cost upwards of twenty millions of dollars a year in the United States, to say nothing of the large sums of money spent for insecticides, spraying apparatus, chemicals, and the like, all, at the best, only makeshifts. A number of the pupæ of the parasite were packed up in Spain and sent to the Commission in San Francisco. They hatched out into healthy flies, and various meals in worms were in waiting to satisfy the appetites of these Spanish-bred insects. The worms were on branches of apple trees gathered from infected orchards, some on the surface, some under the bark. The branches were placed in glass cases, and the flies were let loose among them.

The work of destruction began instantly, the flies searching out the worms unerringly and laying a large number of eggs, a few at a time, upon the worms—about two hundred and fifty eggs in all. The object of laying them upon the worms is that their progeny, when hatched out, may have food at hand. The tiny grubs hatching from the eggs feed upon the worm, and at the end of forty-three or forty-six days they are full-grown flies, ready to begin their work of destruction. In a relatively short time a very large number of flies can be produced, more than four thousand healthy flies coming from the very few pupæ that were sent from Spain.

Its Distribution in California.

The flies were sent out to different parts of California in small quantities during the season of 1905. Applications came from very many quarters, for the worm was doing deadly work on the apples. The Commissioner, however, thought it best to distribute them over various parts of the State rather than to individual fruit-growers, so that all the varying climates and conditions of California might be tested.

The results have been signally successful. Reports have come in from many quarters, saying that the flies were appearing in large numbers, and that apple-crop prospects were never so bright. One man noted that his

trees were maturing the first good crop in years, simply because the apples had a chance to mature unassailed by the worms. The flies bid fair soon to restore the balance of nature where it has been overturned, rob the codlin-moth of its terrors, and be the means of saving millions of dollars to the fruit industry of the country.

Origin of the Work.

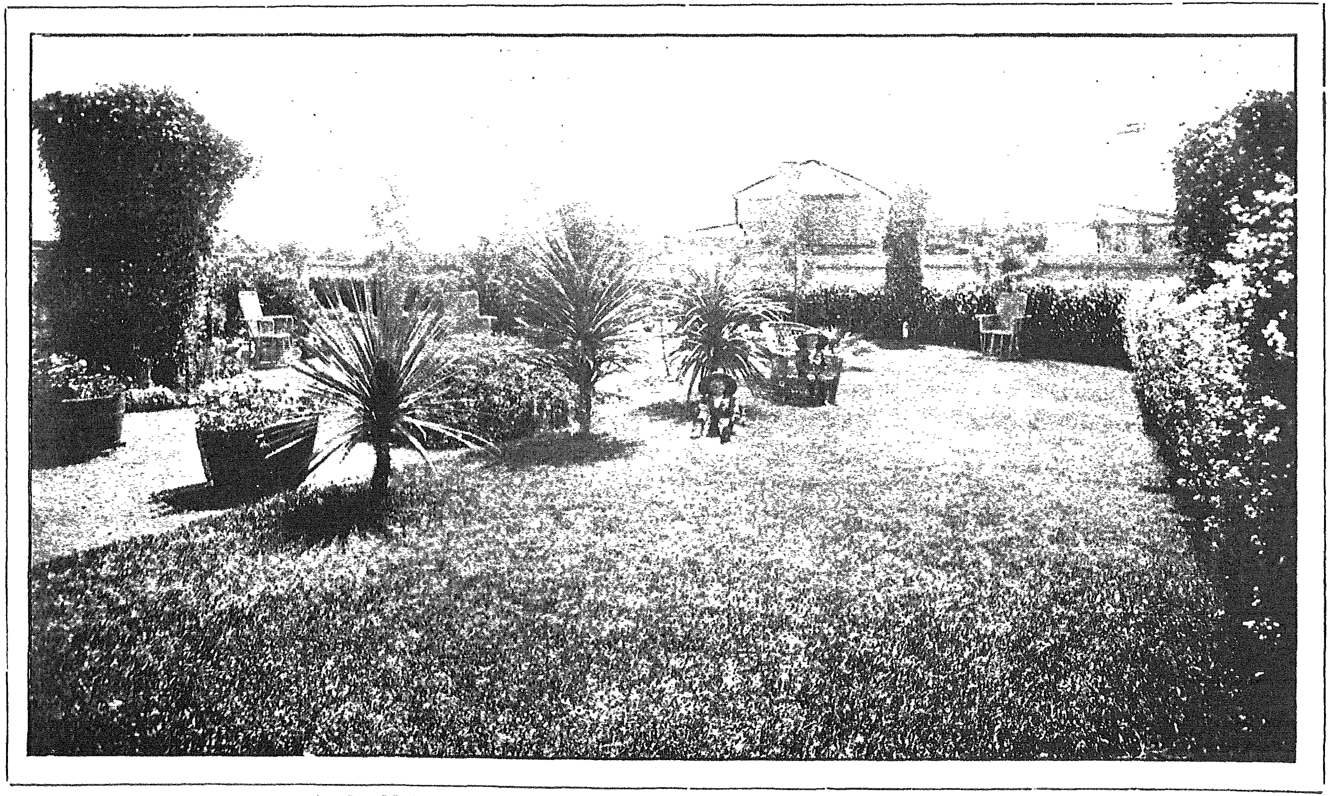
This line of work of the California commission began nearly twenty years ago. In various parts of the State insect pests of types little understood and difficult to combat had for years been doing great damage. It is related that a nurseryman not far from San Francisco, who imported some lemon trees from Australia, laid the foundation—the figure is not altogether a happy one—for millions of dollars damage. Upon his lemon trees was what was called the cottony cushion-scale, a tiny insect multiplying with remarkable rapidity, and capable of doing vast harm. It had hitherto been unknown in America. An orange-grower in Southern California secured some of the infected stock, and the scale spread among the orchards. Sometimes the pests were so thick upon the trees that they were as white as if covered with snow. So terrible were the ravages of the pest, which destroyed all leaf and blossom output of the tree, that in a single year the shipments dropped from eight thousand car-loads to six hundred. None of the many remedies tried did any permanent good. Digging up the trees and burning them was useless, because the pest had spread to all manner of vegetation. The situation was so critical that the ultimate extinction of the orange industry seemed near at hand.

Relief came through the California Commission, aided by other Californians and the United States Department of Agriculture. An expert of the department, Mr. A. Koebele, was sent to Australia, where a variety of ladybird was found—a brilliant red insect, perhaps an eighth of an inch in width, called *Vedalia cardinalis.* It was found to have a particular antipathy to the scale or insect which had been ravaging the orange orchards; was introduced in large quantities, and at once began the restoration of the balance of nature.

It is said that the little ladybird that saved the orchards of California would have starved to death had it had any other food than the cottony cushion scale.

The Black Scale.

Another pest, similar to the cottony cushion scale, is called the black scale. Some time ago it was introduced into California without its foe, and disastrous results followed. Mr. E. M. Ehrhom, now Deputy Commissioner of California, found on investigation that an enemy of the black scale lived in Cape Colony. Request was made by him of Professor Charles P. Lounsbury, Government entomologist of Cape Colony, for the enemy. After the formality of a request from the United States Department of Agriculture had been complied with, Professor Lounsbury sent the foe through the department to Mr. Ehrhom. The first colonies did not do well. Branches or cuttings of oleander, bearing the black scale, parasitised by a black, four-winged fly, known as *Scutellista cyanea,* were then sent from Cape Town to San Francisco. Seventeen insects developed, but, unfortunately, a small spider which had been hidden in a rolled-up leaf in the case pounced upon one of the females and killed her, leaving only three from which to



R. D. McKenzie, Esq., M.L.C., Residence, Collins Street, Kalgoorlie.

build up a race of destroyers. There was apparently a slender chance of providing relief. From the three female flies, however, many eggs came; they were jealously guarded and hatched out, and a numerous brood resulted. They were released in the regions where the pest had begun its ravages during the season of 1905, and at once began their beneficent work. One fruit-grower reported—and his report can be taken as representative of many others—that after the introduction of the foe, the black scale in his orchard was reduced ninety per cent.

The Brown Scale.

The apricot, one of the delicious fruits of California, is subject to a brown scale or insect which not only destroys the fruit and foliage, but by its thick incrustations is liable to destroy the vitality of the tree branches and ultimately to ruin the tree. It also attacks plum and prune trees with equal virulence. There is a minute brown fly, smaller indeed than the tiny ladybird, which has a particular antipathy to this apricot scale. It is a native, and is called *Comys fusca*. The commission keeps a supply of this fly on hand all the time, and whenever there is a report from any part of the State that the scale is appearing, the commissioner despatches a colony of the insects by first mail. They are set free in the orchard where the scale has appeared, and shortly they begin their work of destruction.

On account of its small size, great care is necessary in the production as well as in the shipment and handling of the parasite. When an apricot plague-spot has been cleansed by the parasite, quantities of infested twigs are gathered about the middle of May, and placed in square boxes for the use of the commissioner in future breeding. This foe, which eats its way into the insect or scale, and thus destroys it, begins to emerge from the scale soon after the twigs are stored. A glass tube is fixed in the side of the box. Into this tube the insects crawl one by one as they hatch out, and when twenty-five or more are in the vial, it is stopped with cotton to prevent escape while admitting air. Another tube is placed in position, and so the process goes on, colony after colony being thus secured. Stiff paper tubes are then used to encase the vials in which they are sent out to the infected places for liberation. The results have been highly successful in controlling this pest.

Adaptation to New Food.

Now and then some other insect than the usual natural foe appears and adapts itself to a given pest. This was the case with the San José scale. A native insect, known as the *Aphelinus fuscipennis*, suddenly developed an appetite for the scale. It began to multiply also with unusual rapidity, and attacked the scale so vigorously that it was not long before it had the pest under control. It was simultaneously noticed in various parts of the State where the San José scale had been doing sad damage that the scale was disappearing, and from no apparent cause. It was then that investigation showed how the pest was being overcome. At the present time, wherever in California the San José scale is found, there its enemy is also found, keeping down the pest to its normal numbers and thus preserving the balance of nature.

The Plan Safe.

The question may be asked, what is to prevent the foe of these insect pests from becoming in turn an enemy itself? In nearly every case the

beneficent insect depends upon the injurious insect for its own sustenance. It will not thrive if it is robbed of its prey. So, whenever the foe insect becomes very numerous in an orchard, it does not do harm to the orchard but only to the particular pest of the orchard which it antagonises. It may never entirely destroy the pest, but it reduces it below the danger-line, and keeps it there—the inevitable balance of nature. If the pest were wholly destroyed, its foe also would disappear.

The work of this commission is by no means confined to the instances which have here been brought forward to illustrate the practical value of its work. As rapidly as means will permit, the enterprise will be enlarged, looking to future danger.

State Appropriation.

The State has lately made a more liberal appropriation for the carrying on of the work, which will enable the commission to reap still larger results. It will also afford means for the study of pests of other lands, thus safeguarding this country from them in advance. Among the other pests upon which work is projected, or already under way, are the following:—Plant-lice, prune-aphis, woolly aphis, black peach-aphis, cabbage-louse, grape-louse, pear-scale, red scale, peach-root borer, peach-moth, cankerworm, tent-caterpillars, cherry-slug, harlequin cabbage-bug, box-elder, plant-bug, Fuller's rose-beetle, various types of thrips, red spiders, and mites.

List of Pests and their Foes.

Upward of 200,000 species of insects are known comprising four-fifths of the entire animal kingdom. Very many of these are more or less injurious, but are so held in check by their foes that plagues of insects only now and then appear. The following list of insect pests and their foes, prepared by the California commission, suggests the lines upon which the commission has mapped out its work. The pest name is first given, then its foe.

Predaceous Enemies: Cottony cushion-scale—*Vedalia cardinalis; Novius Koebelei, Novius bellus, Vedalia* (black); black scale—*Rhizobius ventralis, Orcus australasiæ;* yellow scale, *Orcus chalybeus;* San Josè scale—*Rhizobius toowombæ, Chilocorus bivulnerus, Coccinella sanguinæ;* red spider, *Scymnus vagans;* various scale-insects, *Rhizobius;* mealy bugs, *Cryptalæmus montrouzieri;* cypress mealy bugs, *Hyperaspis lateralis;* various aphides—*Coccinella californica, Coccinella abdominalis,* and *Coccinella oculata, Hippodamia ambigua* and *Hippodamia convergens.*

Parasitic and other enemies: Black scale—*Scutellista cyanæ, Dilophogaster californica, Hymencyrtus crawii, Aphellinus mytilaspidis;* yellow scale and San Josè scale—*Aspidiotiphagus citrinus, Coccophotonus;* cabbage-butterfly parasite—*Pteremalus puparum;* brown apricot scale, *Comys fusca,* soft brown scale—*Encyrtus, flavus; Coccophagus lecanii;* parasite of cut-worm, *Braconidæ;* egg-parasite of tent-caterpillar, *Anastatus;* internal parasite of aphis, *Aphelinus.*

Older Methods not Abandoned.

While remarkable results are being reached in this work of extirpating insect pests, the California commission does not advocate the abandoning of

other methods of temporary prevention when the foe of the pest has not yet been discovered. The commission points out, however, that all sprays, washes, dips, and fumigations are cumbersome; they are costly in material, equipment, and labour, and are often ineffectual. Nature has provided a better way than man.

How Pests get in.

The importation of noxious insects into California has been going on for many years. They have come from all portions of the world. Ships from nearly every country on the globe enter the Golden Gate. The commission early recognised this, and instituted measures looking to a strict quarantine. The insects may be introduced from foreign countries in many different ways, chiefly, of course, upon fruit, nursery stock, and plants which have been raised in the regions where the insect pest and its foe have been in balance. No harm would come if the foe were introduced along with the pest; but in the absence of the foe, danger is always imminent. The quarantine is rigorous to harshness. When an infected plant or shrub is found in the possession of a ship passenger, no matter how costly the plant may be, it is destroyed. No chances can be taken. The law gives representatives of the commission special privileges for detecting any diseased plant or shrub. All incoming passengers having plants or shrubs in their possession must give them up for scrutiny on leaving ship at San Francisco or other State ports. Some plants are allowed to land, some must be fumigated, others must be destroyed. Not even a single piece of fruit found in a passenger's luggage by the customs officer can pass without special horticultural inspection. The vessel itself is afterwards searched, and no member of the crew is allowed to bring in anything in this line without rigid scrutiny.

Fumigation.

In case the insects yield to fumigation, the plant bearing them is placed in a fumigating-box, the insects are killed, a red releasing-label is pasted on the package, and the plant is allowed to land. The rigor of the inspection does not tend to make friends for the inspectors, but their work must be done.

The Insectary.

The insectary of the commission is located in a building in San Francisco hard by the wharves, where ships from foreign ports make landing. In the rooms are many cases containing beneficent insects in all stages of development. Many of the pests have a common life history—first the moth, then the egg, the larva, the worm, the chrysalis, the moth again, and so on in never-ending cycle. The foes, like the pests, develop with remarkable rapidity, and as soon as a colony is ready for shipment it is sent out to some infested region, or, if there is a lull in the demand for the foe owing to the season or to the overcoming of the pest, the foe is kept in abeyance, though preserved from family to family in order that it may be ready for reproduction on call. Plans are now being perfected for a larger insectary, with cold storage department, in which the eggs of a given foe may be kept indefinitely, ready for hatching at any time needed.

Loss from Pests.

C. L. Marlatt, of the Department of Agriculture in Washington, has prepared a statement as to the loss by insect pests in the United States

each year. He notes that the losses each year in all the plant products of the soil, both in the growing and in the stored state, together with those in live stock, exceed the entire expenditure of the National Government, including the pension-roll and the maintenance of the army and navy. Placing the value of these products at 5,000,000,000 dollars per year, he notes an annual shrinkage, due to insect pests, of fully 10 per cent.

RAISING TURKEYS.

To the inexperienced person who is contemplating the raising of turkeys for the first time, a few remarks as to general conditions required for best success and a little insight concerning their habits may not come amiss. The farmer who would like to try them as a sideline need not hesitate because of the lack of houses, or indeed any accommodation other than the farm itself. A few boards 14 or 18 inches wide, placed edgewise to form a pen of at least 8 by 12 feet in dimensions or more—the larger the better—a rudely constructed shelter in one corner, and if the spring weather be very wet, another wide board placed on the ground in the sheltered corner for the mother hen to sit on when hovering over her brood. This is the only outfit absolutely necessary to successfully care for the chicks.

As to needing a house when the poults are strong enough to use their wings, they would willingly roost on its roof, but never inside unless driven in and the door shut tight. You should not begin with more than two or, at the most, three hens; then when you are able to raise at least 80 per cent. of their hatch, it will be time enough to think of adding permanent conveniences. After you become proficient, you will experience no trouble in raising 90 to 95 per cent. of all chicks hatched. One must grow up with this business as with any other. I am reminded of a neighbour woman (says a writer in an exchange) who, removing from town to their newly-acquired farm, undertook that summer to care for the hatch of 12 hens. I foresaw the end, and advised her as best I could, but she was very enthusiastic, and worked early and late with them. But the final result of the whole season's work was an increase of an average of three-quarters of a turkey per hen.

Often in the late summer and fall visitors call here to see what they pronounce "a sight—so many turkeys in one flock"—and will occasionally say that they do not see why everybody does not try to raise large flocks; that 150 or 200 should be no more trouble to raise than 50. To all who think this I have only to say: Make the experiment once, and you will then know more than I can possibly tell on paper. The trouble seems to be that so many make the mistake of confusing turkey-growing with the chicken business, when really it is very different. While chickens often thrive to a

certain extent under very unhealthy conditions, turkeys, on the other hand, while apparently very hardy, soon succumb if far removed from conditions naturally favourable to them. For this reason they should not be kept for long at a time in small pens, nor be compelled to roost in close houses, nor be fed on filthy ground.

To make a comparison that most farmers will understand, turkeys, for the greater part of the year, should be treated as nearly as possible like sheep. And here let me say that if at times I seem to say that turkey-raising is light, pleasant work, suited to the strength of women, and, again, that it is arduous labour fit to command the attention of men, it is not that I am inconsistent, for the keeping of a pen is child's play to the care and work required for a large number. But whether one grows few or many, the profit in them is well worth the time and attention bestowed. The wider the range the less trouble they will prove. No one should try to raise turkeys unless they can command at least a few acres of pasturage for them at home. It is not quite honest to raise them year after year on one's neighbour's farm.

Where the average farm is large, and the range practically unlimited, the turkey may indeed be allowed to hunt its entire living until cold weather; but on a fifty to one-hundred acre farm, if it is not bounded with a turkey-tight fence, one must feed them bountifully and regularly to keep them where they belong; for a turkey, unless better trained, always wants to be on the other side of the fence. You are not told this as a discouragement, but as a warning not to neglect the training of them at the proper time, for they can be readily trained to stay within proper limits, also to always stray in a certain direction. And it is still easier to teach them to come home to roost. To succeed in this, one must begin with them while the birds are young.

Some folks consider turkeys such senseless creatures, but this is because they have never studied them closely. On the contrary, I consider turkeys the most intelligent of all fowls. A number of hens kept through the laying and brooding season will present to the careful observer so many different phases of temperament—if I may be pardoned for the use of the term in such connection—as to be positively astonishing. And these same characteristic habits of the pullet will abide with her as a hen to such extent that by this means one may be able to easily distinguish certain hens from others of the flock.

This applies only during the breeding season, however, for as soon as they choose to consider themselves relieved of all their responsibility for the season they soon become apparently possessed of only ordinary turkey sense until the time comes that will once again call for the putting forth of their best efforts. We might almost deduct a moral from this peculiarity of the turkey.

It is this: That just so soon as we cease putting forth our very best endeavour, at that moment do our faculties begin to rust. By an infinite law we perforce advance or fall back. Life is resistless change. And we would best keep step in the march. As one cannot depend upon the mother turkey to bring her little ones home because of her instinctive caution, one must strive to gain the confidence of the poults. This is best done by giving abundant food—always reserving their favourite dish for supper—keeping up your custom of sometimes allowing them to fight among one another for the privilege of eating from your hand as you did for

amusement when they were younger. Always treat them with uniform kindness and gentleness, and teach them to know the sound of your voice; and from the time they are ten or twelve weeks' old, the most careful old mother in turkeydom will find herself unable to keep them from hunting you up about sundown. When that time comes you will not need to be reminded of your duty toward them; on the contrary, if a woman, you may find yourself in danger of becoming too fond of them.

Growing up far removed from farm life, when I began living on the farm I was naturally much interested in all the farm stock, and especially the poultry, and although the turkeys were queer-looking strangers—so strange, in fact, that when, one never-to-be-forgotten day, I discovered a funny speckled egg in a chicken hen's nest, I got laughed at because I could not tell what kind of a fowl produced it, being the first turkey egg I had ever seen. Nevertheless I joyfully welcomed all the queer downy-striped chicks that seemed to be all necks and legs. Dear me! what fine poultry they were and what a pleasure it was to care for them that summer. But when market time came and they had to go the way of all fowl flesh, I felt—well, to put it mildly, I felt much as a bachelor girl would be expected to feel if required to give up her cats.

Even the substantial sum I received for them failed to quite make me forget. I might add that after various bereavements I learned in time to do as most farm folk—to not make pets of every animal and chicken on the farm. To spare your feelings you should only have two pets, your driver and the dog.

PIG-RAISING EXPERIMENTS.

As no question is of greater interest to the majority of farmers than the best method of raising young pigs from the time of weaning till they are ready for killing, the results of some experiments conducted at the Government farm, Ottawa, Canada, will prove of great interest. The foods selected were those that are everywhere obtainable, and as low in price as possible. The experimental pigs were all confined in pens during the winter months, when it is, of course, more difficult to raise pigs than in the summer.

The first lot were fed on pollard and skim milk. On this ration they gained between four and five pounds per day, and gained 100lb. on 152lb. of pollard and 554lb. of skim milk. The second lot were fed on pollard and maize meal in equal proportions, but the results were far from satisfactory. A third lot were fed on pollard and oil-cake in the proportion of four of the former to one of the latter, 280lb. of this producing a gain of 100lb. at a cost of 12s. 11d. per cwt. The fourth lot were fed on oats and ground oil-cake, and made 100lb. gain on 322lb. of feed, at a cost of 14s. 11d. per cwt. This feed was found objectionable unless the oats were very finely ground.

The fifth lot were fed on a mixture of oil-cake, pollard, and oats, and to this was added equal parts of skim milk. These pigs gained at the rate of from 2lb. to 3lb. per day, and made weight at a cost of 11s. 11d. per cwt.

It is customary on many Canadian farms to keep pigs in the open, penning them off in small herds, and changing the ground as often as necessary. A series of experiments were conducted in order to determine whether those in the open or those inside did the better. A mixture of meals and skim milk was employed, and it was discovered that the gain cost 15s. 5d. per 100lbs., or nearly double what inside feeding cost with the same rations. Hence it appears that the cost of producing a pound of pork outside, where no shelter is provided, is nearly double the cost of production inside, and that protection from extremes of heat and cold is essential for the production of cheap pork.

At the Agricultural College at Guelph some very interesting experiments were also conducted, in this case the endeavour being to find a substitute for skim milk in pork production. Tankage, a by-product from the slaughter-houses, composed of blood and entrails purified and made into a meal, has given very satisfactory results as a concentrated and highly nitrogenous food. In the experiments the meal ration consisted of pollard, barley, and oats, with a little green food added, the proportion of barley being double that of oats at the latter stage of the experiment. The meal was valued at £3 15s. per ton, and the skim milk at 5d. per cwt. The following is a summary of the results:—

(1.) Two parts of skim milk to one part of meal made 100lbs. of gain, at a cost of 10s. 11d.

(2.) A ration consisting of one part of tankage, costing £6 per ton, to ten parts of meal made up as above, made a gain of 100lbs. at a cost of 15s.

(3.) One part of blood meal, costing £10 per ton, to ten parts of the grain ration, made 100lbs. of gain, at a cost of 16s. 3d.

(4.) Meal alone made 100lbs. of gain, at a cost of 14s. 11d.

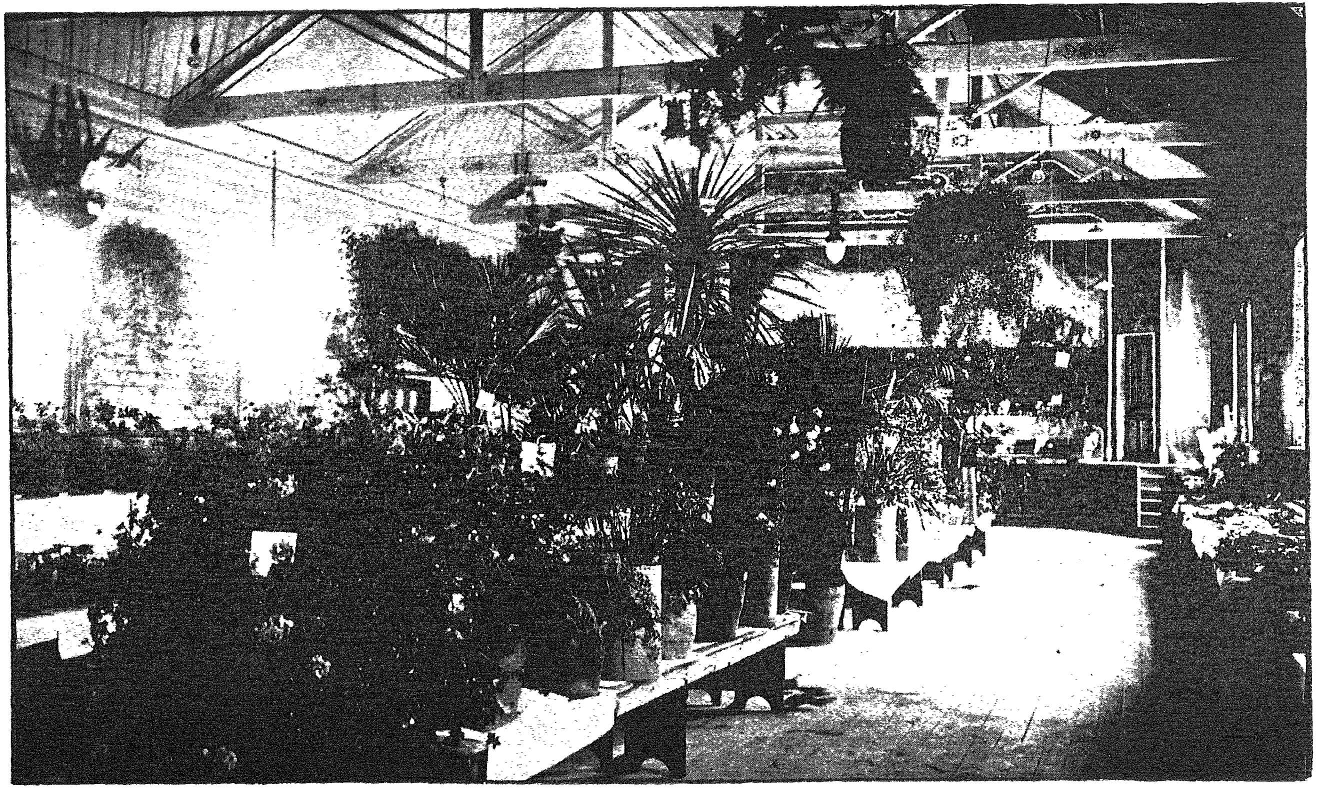
(5.) A mixture of rations, the proportion being 1lb. of meal, 1lb. of milk, to 1 part in 15 in tankage, created a gain of 100lbs., at a cost of 14s. 1d.

A brief experiment was also conducted in inside and outside feeding. One lot, pastured first on clover and then on rape, and given all the meal they would eat, cost 18s. 8d. for 100lbs. of gain. A second lot, fed on two-thirds the amount of meal, made gain at a cost of 16s. per 100lbs. No allowance was made for the cost of the green food in making these estimates. The results of these and other experiments demonstrate that it is impossible to feed pigs as economically outside during summer as inside.

The pigs in the above experiments were selected Yorkshires, some with a little Tamworth and others with a little Berkshire blood.—*Elder's Review.*

STORING WHEAT.

At a recent meeting of the local Agricultural Society at Paskeville, the Secretary of the Society read the following interesting paper on storing wheat:—"The time has now arrived when farmers must seriously consider, with a view to bettering the present system of marketing our staple product—wheat. The farmer taking his wheat straight from the field to the nearest market, and selling, is not affected, because he has an open market to deal in, and can command the best price then ruling amongst the various competitors. But on the present system of storing wheat with the merchants, with the object of obtaining a better price later, he wished to enlist the attention of thoughtful producers, to whom, if they give the question the slightest consideration, it must be apparent that to a great extent it defeats its object. It is hardly likely that a merchant will be disposed to raise the price of an article in order to become the purchaser when he is already enjoying the use of that article free. The person storing with the merchant has to depend too much on his honour, which, as he knew to his cost, was not always to be relied upon. This question was not of so much consequence in the past as now, and he was sure, with a continuance of good seasons, it would assume even greater importance in the future. In the past but a few farmers were in a position to hold over or store their wheat to await better prices; but now most of them, if so disposed, can do so, with the result that a very considerable quantity is stored with the merchants, and acts like a dead weight to drag the price of wheat down. Then the question naturally arises 'What else can be done with it?' To this he would reply, 'Store it at home.' 'But look at the damage and waste by mice.' Build proper barns and stack your wheat in the proper way, and more will be gained by increase of weight than will be lost through mice, etc. He had wheat stacked for nearly a year in normal seasons (that is, when there was not a plague of mice), and had scarcely had a bag cut by them. He had weighed bags of wheat into barn in summer, and weighed them out after winter, with the result of a gain of 8lb. each. Now, as to what a proper barn for storing wheat should be:—Stone, with an iron roof; but there should be plenty of ventilation without actual wet. Such moisture as would come in the air will do no harm; in fact it will increase the weight. But no rain should be allowed to get in. Plenty of air holes should be left in the wall low down, near the level of floor. They could be on the same principle as the narrow slits left in the wall of a stable or loose box, but should have perforated zinc built in across them to prevent mice, etc., making use of them for an entrance. If the doors of barns were made to fit closely, so that mice could not run straight in as is generally the case, there would be fewer mice to deal with, and with proper stacking a few good cats would keep such a barn almost free of mice. The right way to stack wheat is to do it in as open order as possible. His system was to start, say, along the back end wall, place the bags on their edges with the bottoms about six inches or a foot from wall, keeping them in pairs. A little space between each pair would be all the better, but the stack will not be so solid or upright as if the bags all touched. This can be carried on right across the end, or as far as desired. A better way, perhaps, would be to leave a



Boulder Horticultural Society's Show, in Mechanics' Institute, Boulder.

narrow passage down the centre of barn. To do this the pair that should be in the centre should be omitted. On each pair of these bags, then, put another two bags, but crosswise, and continue this right up as high as desired, always putting each pair across the pair beneath. Wheat stacked like this, and in a barn such as described, will not be liable to get weevilly, unless reaped very green or damp. But the principal advantage is that the mice cannot find any place secluded and cosy enough to establish a home, and the space between each tier, besides leaving a free ventilation for air, gives a right-of-way for cats."

RAMIE.*

A. RIVIÈRE.

During the last fifty years Ramie and China-grass have been regularly cultivated in the French colonies, as well as in other countries, particularly in India and the Dutch colonies. During the American war the European manufacturers tried this textile material, but the production being insufficient, and the treatment difficult, the use of it soon came to an end. The Universal Exhibition of 1878 gave it a new start, however, but the trade was still stopped by the inherent difficulties of decorticating and degumming the plant. It was thought that the Exhibition of 1889 would provide a solution of the difficulty, but the results of the International Congress did not modify the position of the subject, which was interesting the whole colonial world. It is evident that the peculiar glutinous and insoluble matters which surround the fibres in the cortical layers present great obstacles to the mechanical and chemical treatment necessary for degumming. It made one fear that because the Ramie could not be prepared in a perfect and economical manner it could take no particular place in the textile industry, which was already well supplied with the principal known fibres—hemp, flax, and cotton. In other words, a new textile, dear and difficult to use, perhaps equal to flax but inferior to silk, was not wanted. This was the situation in the French industry, particularly as our production of hemp and flax sufficed for its requirements. But this opinion altered sensibly in Europe when our crops were in danger of failure, and people began to ask if some day we should not be unable to obtain cotton, which our colonial possessions do not produce. The supply of textile raw material might fail from some cause or other, and already the cultivation of flax and hemp has nearly ceased in France, in spite of the premiums offered, which, in 1889, amounted to 2,500,000 francs (£100,000), equal to 92fr. 50c. per hectare (about 30s. per acre). France would then have to obtain from abroad all

* Extracts from the *Report of the International Conference* held in Paris.

the raw materials used in her manufactures, and the question arose whether her colonies could not furnish to the home factories Ramie fibre, which seemed to be an excellent material, and could be largely used. Similar opinions seemed to influence other nations in their attempts to utilise Ramie. All colonial agriculturists seem to think the easy cultivation of this perennial plant would admit of its competition in certain cases with cotton, while the manufacturers also hoped to find in its textile fabric an exceptional quality and firmness. The situation has thus changed. Ramie is really wanted by the textile trade, and its use cannot be prevented merely by some difficulty in its defibration—as that will be overcome.

The case is as follows: The China-grass supplied by the Chinese to European manufacturers is insufficient for their needs. Its price is very variable—often very high. This raw material is sent to our market in the form of strips, which have been obtained by sundry manual operations—scraping, soaking, drying—which have caused it to lose a large quantity of the gum.

The manufacturers ask:—

(1.) If the culture of Ramie, which is at present confined to part of Central Asia, cannot be extended to other localities having similar or more favourable climate.

(2.) If the manual labour of the Chinese can be replaced by mechanical or chemical processes, so as to produce a cheap article, and at the same time preserve the quality of the fibre.

(3.) If the cultivation and manufacture of Ramie would pay, based on a similar price to that of China-grass, or even higher than the latter, according to the state of preparation.

Different Kinds of Ramie.

There are two kinds of Ramie plants which, if properly grown and prepared, would be bought by the textile trades in Europe in any quantity, and at a very remunerative price:—

(1st.) *Urtica (Bœhmeria) nivea* or white China-grass.

(2nd.) *Urtica utilis*, or *tenacissima*, green Ramie, from Java and the Indian Archipelago.

The first will grow in temperate zones, but the second only in tropical or semi-tropical climates.

White Ramie.

One of the characteristics of this plant is the annual up-growth of the stems, which disappear in the autumn after having fructified. Another is the white down covering the undersides of the leaves.

This plant originates in China and Oriental Asia, having been cultivated for centuries by the Chinese for their own use, the excess of production being exported to England under the name of China-grass. It grows in temperate zones like the olive and orange, and flowers in the autumn, after which the stems dry up, showing apparently no life until the following spring. It is of importance to cut the stems before the flowering, or the fibre is spoiled. After experiments made in different climates, it has been found that the *Urtica nivea* is unsuitable for tropical or semi-tropical countries, as the abnormal growth and constant flowering prevent the stems

from maturing, and reduces both the quality and quantity of the fibre. It thrives, however, very well in temperate zones, where the heat is not excessive in the spring and autumn, and where only slight frosts occur in the winter. It may be laid down as a general rule that the growing of *Urtica nivea* will not give good economical results in any but a temperate zone, the extreme limit of which is to where sugar cane and bananas can be grown. This plant fructifies abundantly, and the seeds are fertile; in the experimental farm in Algiers, very large crops have been obtained during the last 40 years.

Green Ramie.

This species, *Urtica tenacissima* or *utilis*, is distinctly characterised by having perennial stems and the undersides of its leaves almost green, but sometimes very slightly covered with a white down. It is a native of Java and the Indian Archipelago, and for industrial purposes ranks equal, if not superior, to China-grass. It grows like a shrub; the stems speedily throw out branches and become ligneous, rapidly increasing in height and diameter. It lives for several years, and the flowering is not followed by the drying of the stems, as is the case with the white ramie. The flowering periods are not numerous, and it rarely produces any seed. In good moist soil, this nettle will take the form of a shrub up to 16 feet high, but in poorer dry soil it becomes a mere bush. The green ramie with its enormous growth is thus more suitable for tropical districts having constant rains or irrigation in periods of drought. Under such conditions this plant rapidly produces stems 6 to 7 feet in height, which should be cut for treatment in the green state, before the appearance of the side-shoots, but when having arrived at a certain degree of maturity. A peculiar characteristic of this ramie is that when a stem is cut, leaving a fair-sized stump, this stump will throw out side shoots which develop into high stems. This, on the contrary, never happens with the white ramie, the stems of which are annual, while the shoots spring from the root. There was for some time a doubt as to the industrial value of green ramie, though its richness in magnificent, strong fibres was well known; but lately the difficulty in its mechanical and chemical treatment has been overcome, and many manufacturers now prefer it to the white ramie.

This is of importance to the cultivator operating in warm climates, as the constant and exuberant growth of this species enables him to get several crops and a correspondingly better financial return.

This ramie is now sufficiently well known in the trade, and should give any grower an excellent result in suitable localities; that is, in warm, moist climates, where the vegetation is not interrupted by insufficiency of rain, or where irrigation can be applied during dry periods.

Treatment of Ramie in a Dry or a Green State.

The methods of treating the stems are of great importance to the grower, as the price obtained depends on delivering to the manufacturers the article most suitable for their machinery.

The treatment when in a dry state necessitates full-grown stems, which in temperate zones will only permit of two crops per annum; while, on the contrary, when treated in a green state the stems need not be so fully developed, and several crops can be obtained.

Treatment in the dry state.—It is difficult to explain why so much attention has been paid to this mode of treatment. No earlier records give any indication of it; in fact the people of Asia, notably the Chinese, who for many centuries have used the nettle fibres, have never prepared them in a dry state like flax and hemp are treated: on the contrary, they decorticate them absolutely green, and remove the bark while the stems are growing. It would be a false economical basis for one to compare ramie with flax and hemp; believing that the unique advantage of the dry treatment consists in the ability to store it in stacks or sheds until an opportune time for decorticating. The grower might then perform this work in the winter time when other labour is slack. In France, and even in those parts of Europe most favoured by the climate, it would be almost impossible to dry the stems in the open air. Moreover, as regards France, the growing of ramie does not seem to have given very satisfactory results. Even in the colonies the moisture of the air is too great to enable us to obtain, by open-air drying, stems sufficiently dry to suit the decorticating machines at present in use. In India and China, where the growth of the ramie is very abundant, and labour very cheap, it is impossible to get the stems, even comparatively, dry in the open air, and any attempt at storage will lead to fermentation, and consequently the fibre will be spoiled.

The dry stem is also hygrometrical, and rapidly absorbs the moisture in in the air, as has been proved by experiments with stove-dried plants.

Insufficiently dried stems cannot be decorticated satisfactorily, as the beaters and scrapers of the machines, acting upon a soft spongy matter, weaken and soil the fibres, without fully removing the woody part, or even the cuticle. When exposed to the air this latter becomes of a brownish colour, hard and horny, resisting all efforts to remove it by machinery.

The strips thus obtained can only be cleaned and deprived of cuticle and gum by means of chemical baths, which often have to be so strong that they damage the quality and strength of the fibre.

The machines for dry work require to be fed with well-grown stems of fairly uniform diameter, in order to produce good strips.

If the stems are cut before maturity they often become flat and out of shape in drying, and the machine does not act uniformly on all the surfaces, but leaves a good deal of woody substance in the strips. With well-grown and perfectly dried stems, certain machines do good work in removing the bark and woody part, but the strips retain the cuticle, which is very difficult to get rid of by the chemical baths used for the purpose at present. All these objections apply when the stems are passed through the machines as a first operation after being dried; but we hear of a new method of first submitting them to chemical action, and then decorticating.

So far the decorticating has been found very difficult, particularly in tropical humid climates, where the crops are very heavy.

It often involves manipulations very costly to the cultivator, and is sometimes impossible if he has to cut the crop and spread it over large areas to dry.

Some authorities contend that drying in stoves is the only effectual mode of getting rid of the moisture, but that is impracticable, and would greatly increase expenses.

Treatment in the Green State.—It is very easy to decorticate the ramie stems in a green state, and the Asiatics use only this method in treating their fibre nettles. Immediately after the stem is cut there is no difficulty in removing the bark and woody part, on account of their moist state, without many fibres adhering to them. The Chinese, in fact, often decorticate the plant while growing. Many decorticating machines have failed to give satisfactory results because they have been fed with only comparatively green stems, which have already lost a good deal of their vegetable moisture. This leads to a question important for both cultivators and manufacturers. At what stage of its growth ought the ramie to be cut, or in other words, what is meant by green stems? Recent experiments demonstrate that the best time is just after the stems have reached their full height, when still herbaceous, soft and succulent, and when the bark has formed, but not become brown. At this period, before the appearance of the eyes at the axils of the leaves, the primary useful fibres are already formed, and have sufficient strength; but afterwards only layers of useless fibre are produced. It is therefore clearly a mistake to let the bark thicken, hardening the epidermis and increasing the woody part. In time the fibres lose their fineness, flexibility, and whiteness, in short, their most valuable qualities, and become more and more surrounded by the hardened cuticle and gum, two substances which are very difficult to get rid of when ancient.

To minimise the formation of these deleterious substances the plants should be pretty close-set and well watered, to induce a rapid lengthening of the stems. In a thick plantation, there are very few leaves at the base of the stem, the ramifications are not developed, and the atmospheric influences act less directly on the cuticle, which consequently remains softer and thinner.

In warm and temperate climates, with good irrigation, as many as five successive full grown crops have been obtained per annum; and the tropical climates, with regular and abundant rains, still more. The use and value of green ramie stems depends entirely on their treatment, and if by certain instruments or machines, the bark, woody matter, and cuticle can be removed without damaging the fibre, and the liquid gum pressed out, strips of fibre will be obtained divided in numerous filaments, and free from a great portion of the useless elements. Care must be taken, however, that the beating and scraping be not too violent or the fibre will be injured.

In order to prevent the hardening of the remaining gummy matter, some authorities recommend that the strips should be placed in a chemical bath, immediately after being taken from the machines. Other authorities would soak the green stems first, or subject them to the action of a certain gas, then dry and work them mechanically. This preliminary treatment by liquids or gas would change the gummy matter to powder, and when the stems were afterwards well dried, decortication would be easy, by means of beaters or stripping machinery.

These operations refer to the green stems, which do not require to reach maturity in order to provide good fibre, and taking everything into consideration, are much easier to treat than the dried ones. The fibres are of a superior quality, and one may cut four times the number of crops—which point is of vast economical importance in warm climates where the stems reach a height of about five feet in 35 to 40 days, when well watered by regular rain, or irrigated.

THE WEIGHT AND VALUE OF THE CROPS.

The results of the crops vary according to the locality, the number of cuttings per annum, the system of treatment, and the skill of the labourers, which makes it impossible to fix a general standard revenue per acre. In taking the gross weight of the yield per acre of green or dried stems, we only obtain a very approximate estimate of the initial value of the crop, as the quantity of useful fibre is not in proportion. The weight of the green stems is generally taken by the purchaser as a basis for his calculations; but this is subject to great variations, and often a great loss of vegetable liquid takes place in an incredibly short time, when the atmosphere is dry. Then the stems have more or less leaves and are more or less compact, according to the season, which causes the weight to vary. In fact, some stems grown in the summer have been found of inferior weight to those grown in the spring, though of the same dimensions. In a carefully cultivated hectare ($2\frac{1}{2}$ acres) we find from 30 to 40 stems per square yard, about 64 inches high, which means 400,000 stems per hectare each crop. The average weight of free fibres is about 3 to $3\frac{1}{2}$ grammes per stem, or 1,200 kilos (one kilo = $2\frac{1}{5}$ lb.) for 400,000 stems, and for four crops per annum 4,800 kilos of "filasse" (fibres not quite completely degummed). Supposing, in round numbers, a yield of 4,000 kilos of degummed fibre per hectare, the sum realised at the present price of 850fr. per ton would be 3,400fr. (£135, or £45 per acre). It is impossible to estimate the exact profit to the grower on account of the varying conditions of production in different localities, but an average minimum of £10 per acre may be counted on, and though the first cost of planting is considerable, the maintenance of the plantation is very simple and inexpensive. To estimate the value of the crop by the gross weight of the stems often leads to serious discrepancies. Though 400,000 green stems weigh, as a rule, 18 to 22 tons, they lose rapidly in weight by evaporation and falling of leaves, and sometimes the same number of stems only weigh 15 to 18 tons, though containing no less weight of fibre than the heavier ones. This depends on the season, the quantity of moisture they hold, and the number of leaves. The profits on ramie growing depend on—

(1.) Whether the cultivator sells his crop growing.

(2.) Whether he prepares it more or less by decortication or other means, when he will have the profit also on this supplementary work.

In the latter case it is the production in fibre which must be considered, but this varies in quality and cost, according to the processes it passes through, and which are more or less costly.

Those interested in ramie seem to have constantly tried to obtain, by mechanical treatment, an article equal to China-grass, and have not thought it necessary to preserve the original great length of the fibres or their parallelism. Some of the decorticating machines, which operate quickly and have a large production, cut the fibres. This, however, makes it more convenient for the manufacturer, as, when entangled, the long filaments are difficult to comb.

It is quite clear that if we, by a simple preliminary process, can eliminate the expense and risk of degumming the raw material later, the product from this treatment will have a very different value to the manufacturer from that of the ordinary coarse strips, and a large daily production does not necessarily mean a larger profit. The growers and manufacturers

have, perhaps, hitherto been wrong in seeking only to produce a rich and superior article, and the description of ramie, as a *vegetable silk*, has done harm. The large textile factories seem really to require a fibre of good quality, but ordinary preparation, which they, by ulterior manipulation, can convert into superior goods. The aim should be to produce ramie fibre at a price between that of cotton and linen, when, according to certain economists, the consumption would be unlimited.

The Climate most Suitable for Ramie Growing.

A warm climate with frequent rains, amounting to a total of 8 feet or more per annum, or abundant irrigation in places where there are dry periods, suits the ramie plant best, and where the temperature does not fall below freezing point.

Mode of Cultivation.

There is no doubt that plantations on a large scale, where machinery can be used for cutting and decorticating, will pay best, as the manufacturers require large quantities of a uniform quality, which could not be assured when buying small lots grown in different parts. Decorticating and degumming should be done on the spot to prevent fermentation, as it is almost impossible to avoid damage—at any rate to the interior of bales of gummy fibres when shipped long distances. China-grass can be transported safely, because it only contains about 25 to 30 per cent. of the original gum.

The cultivation of ramie is very simple, and consists principally in a thorough preparation of the soil. It should be planted in good, deep soil, the clayey, silicate, calcareous, and that rich in humus being the best for the rapid production of good crops. In regions where there is not a regular rainfall irrigation must be resorted to.

The preparation of the soil consists in—

(1.) A deep ploughing (by steam plough preferably).

(2.) Working the surface light.

(3.) Making irrigation channels spaced according to the volumes of water at disposal.

The land should be level, and the plants or roots placed 10 to 12 inches apart in shallow furrows, spaced about 12 inches. After closing the furrows the plants must be watered. Planting in ridges is not to be recommended. After the soil becomes dry it should be worked over again twice.

In a plantation spaced as above, it will be found impossible to dig after a lapse of two months, and irrigating only has to be attended to. In a few months the growth will have become so compact that all labour is impossible and useless. The annual work is then limited to irrigation and to applying periodically artificial fertilisers, such as nitrates and superphosphates. In fact, the principal cost of growing ramie is at the commencement, and may be calculated according to the price of labour in the locality—

(1.) Deep ploughing.

(2.) Keeping the soil light.

(3.) Planting 1 hectare ($2\frac{1}{2}$ acres) = two or three days' labour.

(4.) Cost of plants.

(5.) Digging up several times.

The price of plants in a locality where ramie is grown is about 4s. per 1,000, but of course in other places one may have to pay considerably more.

A good European mower can cut by hand and put in small bundles about 2,500 stems per hour; but the mechanical reaper is quite suitable for green ramie. If the process of treatment necessitates the stripping of the leaves, an adult woman can do about 400 stems per hour, and it is best to do it before cutting.

A good ramie field should show close and even growth, like a field of wheat when the stems will be straight, have few leaves at the base, and the sun less tendency to harden the cuticle. On an average, one should have about 40 stems per square metre (= 33 per square yard) as a minimum; but we often find as many as 58 large and 20 small stems of white ramie and 45 large and 15 small ones of green ramie per square metre.

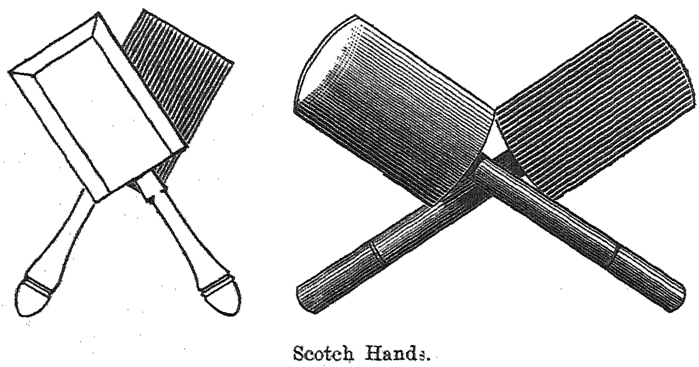
The diameter of the stems of the green ramie is generally larger than that of the white.

If cultivated under favourable conditions, the annual fibre production per acre is superior in quantity and quality to the high-priced *abaca* and *sisal*. This will give an important place to ramie in the textile industries, if the preparation is economical.

DAIRYING.

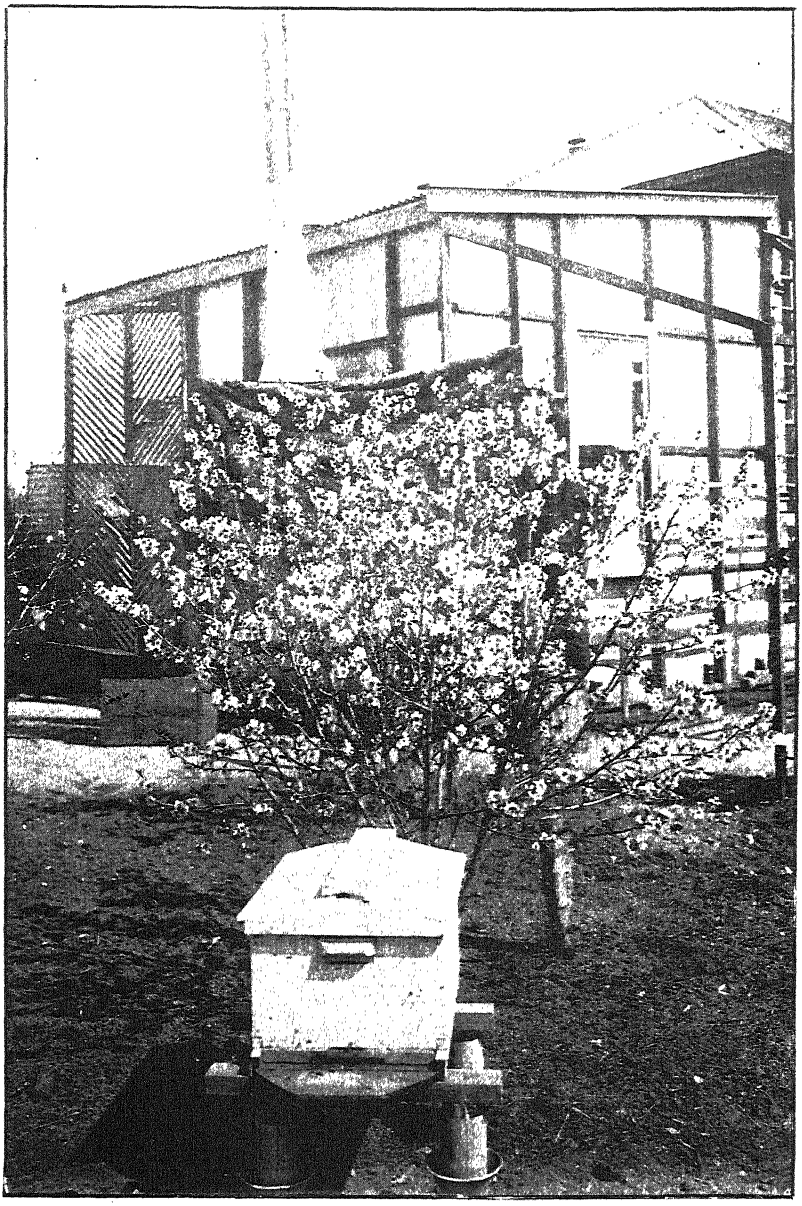
(Continued.)

If it is desired to dry salt the butter, the following process may be followed: Put the butter from the churn in a tub or wooden vessel and weigh it, then place it on the butter-worker, or, if a butter-worker is not



Scotch Hands.

available, on a board that has been carefully scalded and cooled, and allow it to drain for a few minutes. Turn the worker a few times so as to squeeze out most of the water remaining, then add salt according to taste,



C. J. ANSTEY, ESQ., Residence, Campbell Street, Kalgoorlie
(NECTARINE IN BLOOM).

at the rate of from a quarter of an ounce to one ounce to the pound of butter. The salt should be rolled out and all lumps well broken and then dusted in the butter through a fine sieve. Then give the worker a few turns

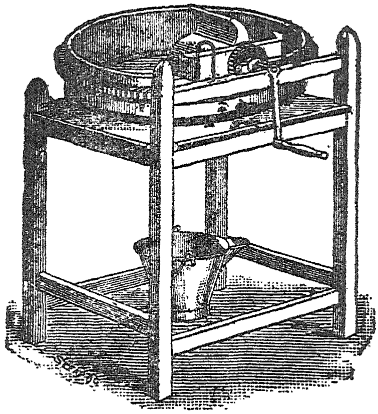


Fig. 15.—Butter Worker.

slowly and put the butter away in a cool place for a few hours. This allows the salt to get thoroughly dissolved and mixed with the butter, and will save overworking. When the salt has thus been thoroughly dissolved the

Fig. 16.—English Butter Worker, for small dairies.

butter is again put on the worker and a few turns will extract all the surplus moisture and leave the butter with a perfect grain, and not a trace of streakiness. If a butter worker is not available a very fair substitute can be used by having the board already spoken of and a wooden flour roller, the latter should be well scalded and cooled, and used for no other purpose. When the butter has been placed on the board and allowed to drain, the roller is slowly passed over it, up and down and across, the salt sprinkled on as before described, and then the butter turned up into a lump with the pats, and slowly rolled rgain. About one-half the salt should only be put on at first, and the rest after the second salting, the butter then put together again and put away until the salt dissolves. When that has taken place the roller may be used again to press out the moisture, and the butter will be ready for printing. The roller should be used slowly, and not worked rapidly backward and forward, or by so doing the grain of the butter may be broken.

The butter has now reached that stage when it is ready for being packed for market. The method of getting up the butter is one of great importance, and is well worthy of care and trouble. Many farmers seem to think that so long as the butter is of good quality it matters little what it looks like. No greater mistake can be made.

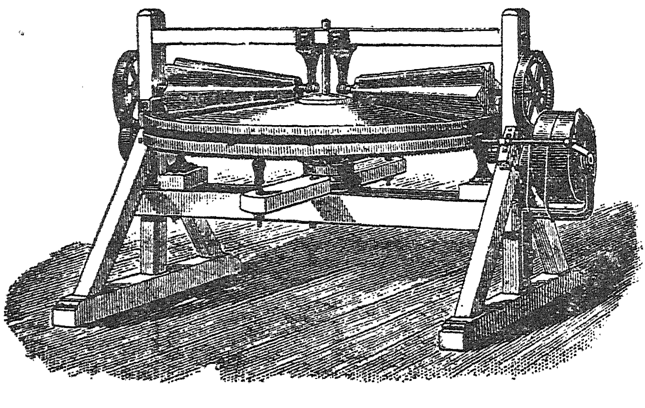


FIG. 17.—Compound Butter Worker, for power.

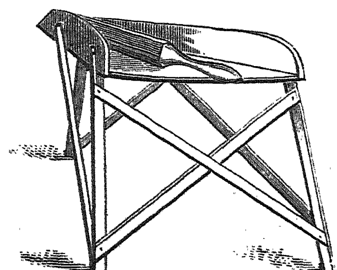


FIG. 18.—Triangular Butter Worker.

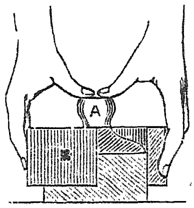
If the butter is good to start with, well and neatly got up and properly packed, it will often bring wholesale 1d. per lb. more than the same butter

would if roughly packed. In fact, I have seen inferior butter, well got up, bringing more money in the salerooms than much better butter that had not the same care and attention spent on it. If this is so in the wholesale market, how much more will it hold good in the retail? The very fact of butter being nicely and tastefully got up tempts the appetite, and causes far more to be consumed.

The foregoing remarks apply to packing both in bulk and in rolls, blocks, or prints, but more especially to the three latter.

The case should not be forgotten, either, and if one with trays in regular use, should be thoroughly well scalded, both inside and out, and kept nice and fresh-looking. Butter that has to be kept for a length of time in boxes is often spoiled by the germs of old stale butter that have been left from many previous consignments.

Printing.—The old-fashioned round print is now gradually becoming a thing of the past, and the sooner it has disappeared the better, for many reasons. It is almost impossible to print it without letting the hands come in contact with the butter—a thing that should be studiously avoided. The prints do not lie close together in packing, and consequently take up space that could be better utilised. Not packing well in the case they are more apt to get knocked about and disfigured when in transit. They are not suitable for table use, being difficult to cut if the butter is firm, and when the print is cut in two it is unsightly. The best form for domestic use is the half-pound block, either oblong or round. These pack well, lying close together; they cut well and look well, either perfectly plain or with the name or initials of the owner, or any other design upon them.



Printing.

They can be quickly made without the hands touching the butter at all, with the ordinary butter pats, or Scotch hands. After they are made, a small block, bearing any device, can be used for pressing on them, or, if that is not desired, the plain look can be taken from them by making diagonal marks with the edge of the pat and crossing them. Numerous devices can be arranged by anyone possessing a little taste. Where a large quantity of butter is to be printed it will be found more economical to use a mechanical weigher and printer.

A very simple and efficient form is that of an oblong box that holds exactly half a pound, or pound, as the case may be. All that is required is a butter board and the box print. Any design can be put on the top of the box that is desired to go on the print. The butter board is well scalded and cooled, and the butter put in a heap on one end, the other end left free for printing. A wooden tray for putting the butter on is placed on one side, and if parchment paper is used a quantity of it is placed beside it.

The print is now taken firmly in both hands, and, face downwards, stuck into a heap of butter and then rubbed backwards and forwards on the

clear part of the butter board to get rid of the surplus. The print is then put on a square of butter paper and the paper turned up at the sides and ends. This is then placed on the tray close to the side, and each succeeding print is placed closely up against its neighbour; but this means the butter on the tray forms an almost compact solid mass that will not move unless the case is turned right over.

The parchment paper prevents one print from sticking to another. By using these appliances, after a little practice, 150 to 200 prints per hour can be weighed and printed. So long as the box is the correct size each print will be exactly the correct weight.

When the boxes are first bought they are generally made a little on the large side, and when it is first used the print should be weighed, and if found overweight a shaving can be taken off the bottom of the print, or, if

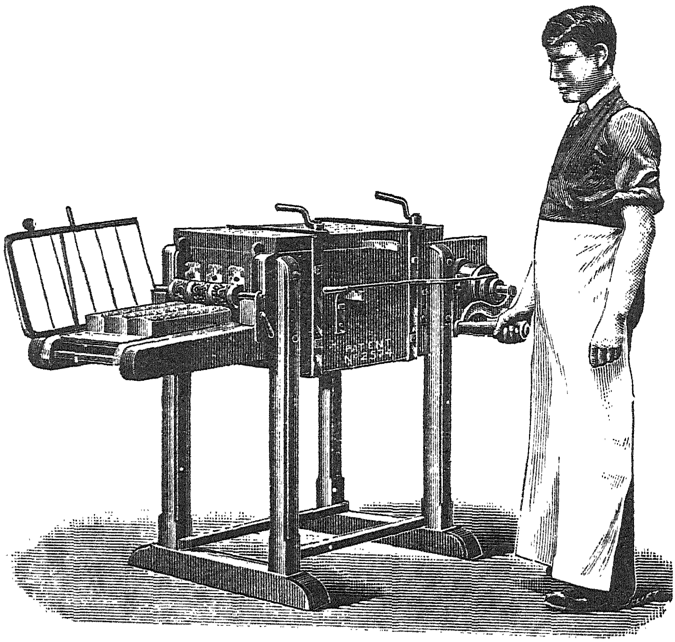


FIG. 19.—Machine for Weighing and Printing Butter.

that would be too much, it can be rubbed down with sandpaper until the exact weight is given. After a time the weight will be light, as the bottom of the box wears away, and this can be remedied by taking, say, a quarter of an inch off all round and putting four slips of wood on, fastening them with brass screws. The slips should be $\frac{5}{8}$ of an inch in thickness, and the correct size got by planing or sandpapering down as in the first case. The cost of a well-made print of this kind varies from about 5s. for a plain one, to 20s. or 30s., according to the design that is engraved upon it.

For those who have a still larger quantity of butter to get through, there are large printing machines made that hold from 50 to 120 pounds, and

print and weigh from 3 to 12 blocks or rolls at a time. These are worked on quite a different principle, and consist of a large box with two or three small holes at one end where the butter is forced through. These holes can be made either square, oblong, round, or half round. A sliding block, the exact size of the box, and worked by a screw, forces the butter out on a set of small wooden rollers that allow it to pass freely over them, and when the rope has reached the end a wire cutter is brought down that divides the butter into the proper lengths and weight. This wire cutter can be adjusted by means of thumb screws so as to give the exact weight, and can be used for making pounds and half-pounds.

These machines are generally used in the large factories, where thousands of pounds have to be weighed and printed daily. They cost from five guineas up to fifteen, these latter being driven by power. There are many other kinds of mechanical printers, but these described here are the ones that have given most satisfactory results and require least adjusting.

For packing bulk butter, by far the best method is in square boxes, containing 28 or 56 pounds; these pack well and require little space for storing, and the butter can be taken out in the form of a solid cube. Great care must be taken to see that the wood used is absolutely tasteless, otherwise the butter will soon acquire the taste and flavour of the wood, and spoil. So far as is known there is no wood indigenous to Australia that can be used, but the kauri and white pine of New Zealand answer the purpose admirably. Kauri being the more expensive, the white pine is exclusively used. If it is desired to keep the butter a considerable time, and no proper cool room or chamber is available, good casks are the best, as they can be made almost air-tight, but the casks must be good and clean, and nothing ever have been used in them that would in any way taint the butter. The great object in packing to make the butter keep well, either in boxes or casks, is to get the butter into all the corners in a solid mass, and thus prevent the air remaining in. To do this it is necessary to have a rammer, and put the butter in in small quantities, and thoroughly ram each layer. Much butter is spoilt for want of this precaution. Great care should be taken to keep the outsides of the boxes clean as well as the insides, buyers do not care to look at boxes that have a dirty appearance.

In everything connected with butter remember that appearances go a long way.

GARDEN NOTES FOR MAY.

By Percy G. Wicken.

Land which has been prepared and made ready for sowing, with the first rain, should now be in first-class condition and bringing all young plants along rapidly; when the rain falls on the warm ground, it supplies to the plants both heat and moisture, which are required for vegetables to develop to their utmost. Later on, when the ground becomes cold, the growth is not nearly so rapid. The season promises to be an early one, and, from the market gardens about the city, cauliflowers and other vegetables have been on the market since March, showing that, if the necessary attention and water are supplied, vegetables can be raised all the summer months. If the young plants get well established before the ground becomes cold, they will do much better during the winter than when sown during the cold weather. Many plants do well if sown during April and early May, but, if not sown by then, are better left until the spring.

If a compost heap has been made, as often mentioned in these notes, it will now prove very acceptable for working into the soil; a liberal supply of manure is required, and it should be well worked into the soil before the plants are put out. All kinds of vegetable refuse and offal will make manure if put into a heap and allowed to decay. A large stock of excellent fertiliser can be accumulated during the year if all the refuse is put into a compost heap.

Drainage requires attention; we shall soon have plenty of rain, and the water should not be allowed to remain stagnant in the soil; as long as the water is kept moving it is beneficial, but as soon as it remains stagnant it is injurious. The best method, if the ground is of a retentive nature, is to put in a series of underground drains; this causes the water to soak through the soil and carry the air with it, while all the surplus water is carried away by the drain, and by this means the soil is kept ærated and sweet. The drains can be constructed of the ordinary agricultural pipes or of whatever material is to be obtained cheapest. Crops grown on drained land mature earlier than those grown on undrained land. Highly soluble or concentrated fertilisers, when used, should not be dug into the soil, but should be spread on the surface and lightly raked or harrowed in, as the first shower of rain will dissolve them and make them available to the plant.

Asparagus.—Although asparagus should not be planted until early in the spring, it is best to have the land prepared some time in advance of the planting time. A trench should be dug two feet deep and the top soil thrown out on one side and the subsoil on the other side; place the soil back in the same order as it came out, the subsoil at the bottom, mixing it thoroughly

with stable manure as you do so. If this is allowed to remain during the winter the bed will be ready for planting in the spring, and a supply of more soluble fertiliser may then be added.

Broad Beans.—Sow a large supply of this vegetable. They should be sown in drills, three to four feet apart and about five inches apart in the drills. If, when in flower, they do not set, the tops should be pinched out, which may have the desired effect. Apply fertilisers containing potash and phosphoric acid.

Beans (French).—In a few sheltered positions in the warmer parts of the State a few rows may be sown, but not where frosts are likely to occur.

Beets.—Plant out plants from seed bed or the seed may be sown direct in the rows and thinned out later on. Only a few should be sown to keep up a succession.

Brussels Sprouts succeed best in a cool climate and should be largely grown, as they are an excellent vegetable. Plant out any plants raised in beds and sow a further supply of seed for future use.

Cabbage and Cauliflower.—Early cauliflowers are now being sold in Perth. All plants already up should be kept well hoed and the surface soil well worked. Give plentiful supplies of liquid nitrogenous fertilisers as the plants are gross feeders. Plant out all the seedlings you have and sow a further supply of seed for future use. Good cauliflowers always command a good price, and have a ready sale.

Carrots.—Sow liberally of this plant. A good supply is always welcome for home use, and if plenty are available the horses will do well on them. Sow thinly in well-worked soil that has been manured for the previous crop as fresh manure is not good for the roots. Keep the young plants free from weeds.

Celery.—Plant out some seedlings in a well manured trench and hill up the older plants so as to cause them to become bleached.

Leeks.—Sow a plentiful supply during the month. They require well-drained and well worked soil, and a liberal supply of fertiliser. They are best raised in seed beds and planted out as they are then better able to hold their own against the weeds than if the seed is sown direct in the beds.

Onions.—Sow the same as leeks. They should be planted in rows about 15 inches apart, and from four to six inches apart in the rows.

Parsley.—A little seed may be sown.

Parsnip.—Dig the land deeply, and sow a few rows to keep up a supply.

Peas.—Earlier sown peas should now be well forward, and the climbing varieties will require staking. Sow a further supply, say a few rows every fortnight so as to keep a supply coming forward. Peas always find a ready sale and are also welcome for home use.

TURNIPS.—Thin out and weed those already up, and sow a further supply of seed, particularly of the Swede varieties. Keep the cultivator going between the rows, and give the plants plenty of room to develop if large size turnips are required for show purposes or stock feed. If for table purpose medium size ones are better.

FARM.—Last season we had some early rain in March which was of great service to those who were waiting to commence their ploughing. This season, March, has passed over and no rain has fallen, and up to the time of writing these notes there is no prospect of any, consequently the season will be later than last year. Sowing wheat commenced in the Eastern districts on 26th March and there will be a great quantity in the ground waiting for rain to enable it to germinate. So long as a good fall of rain takes place these crops will do alright, but if only a light shower falls and this is followed by a spell of dry weather, the seed is likely to germinate and then dry off and require to be resown. In this climate the risk is a light one and failure seldom occurs. Early sown crops generally give the best results. All seed wheat should be pickled in a solution of bluestone before being sown; this prevents the smut spores from spreading, a strength of 1lb. bluestone to five gallons of water is generally used. Particulars of this method will be found on another page in this *Journal*. All those who want to improve their yield of wheat should try a few varieties of wheat and several fertilisers, so as to find out which give the best results in their district.

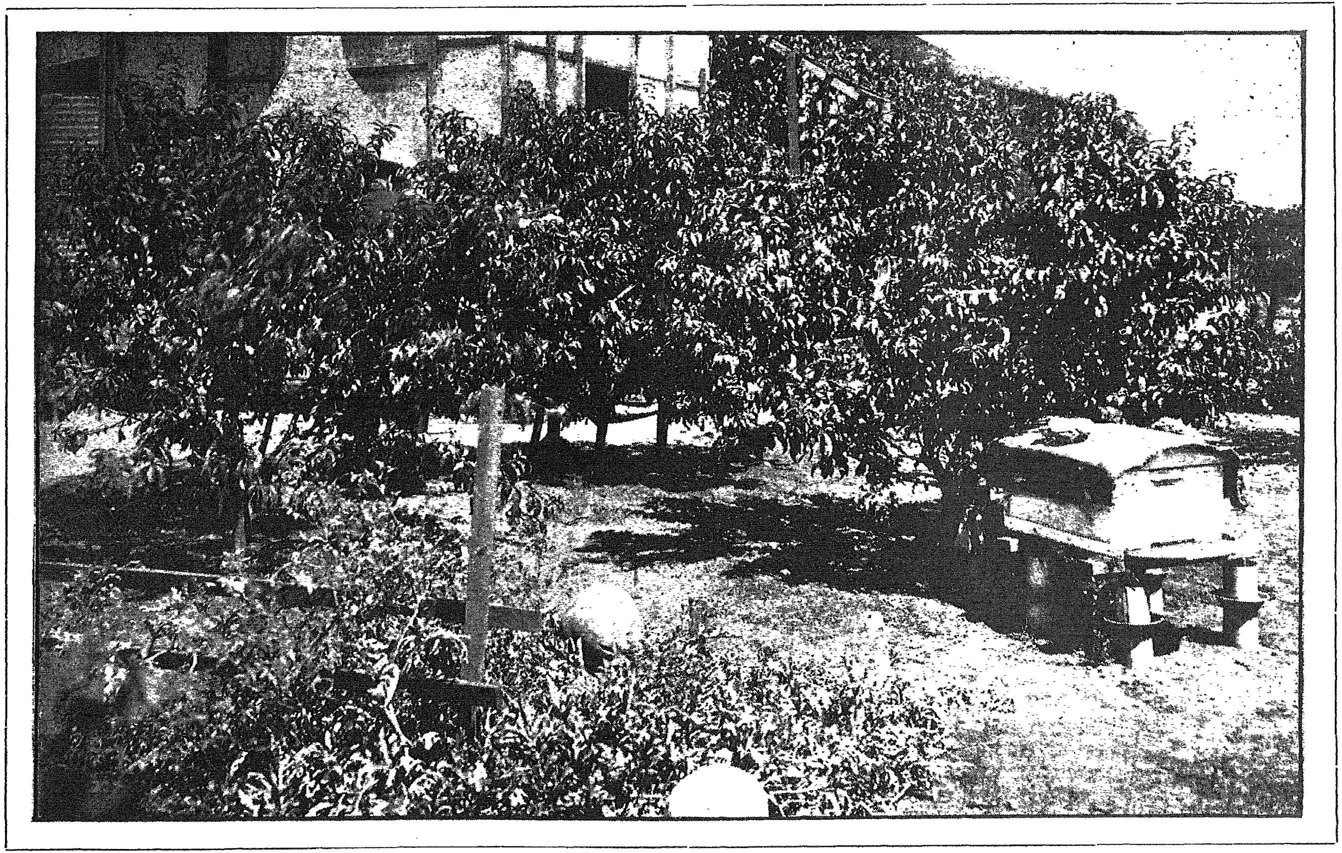
AUSTRALIAN WOOL TRADE.

FOR THE SEASON 1905-6.

1,400,000 BALES.

The following article on the production of wool in Australia is taken from the annual review issued by Messrs. Goldsbrough, Mort, & Co.:—

It was our pleasant duty and privilege at this time last year to congratulate wool-growers on the eminently satisfactory season they had had, both in point of view of abundant pasturage, and a high level of prices, and it is doubly gratifying to record for the year just ended, a continuance of good times, with prospects ahead that were never better. The most striking feature of the year has been the fact that a record has been established in the Australian wool markets, in that the number of bales sold therein for the season has reached the enormous total of over 1,100,000 bales. The total



C. J. Anstey, Esq., Residence, Campbell Street, Kalgoorlie (Nectarines).

estimated Australian production is 1,400,000 bales, so that the colonial sales have absorbed approximately 82 per cent., leaving for London, of first hand Australian wools, about 300,000 bales, practically the same quantity as was handled there last year. The increase in the colonial sales amounts to about 200,000 bales, representing the whole of the increased clip produced in the Commonwealth. Notwithstanding that last year's production showed a substantial increase on its forerunner, prices have continued on a high plane—on the average better than during 1904-5—and owing to generally good trade conditions in all the consuming countries, stocks held by manufacturers, spinners, and top makers have not accumulated, and were never less than at the inception of the sales.

In the face of a further augmented clip next season (which it is safe now to forecast), the legitimate demand does not diminish, consumption goes on unabated, supplies from other sources are decreasing, and, as far as one can judge, conditions are very favourable for good prices for all products to the Australian pastoralist for some time to come.

The cessation of the Russo-Japanese war, which was expected on completion to adversely affect prices of wool owing to withdrawal of Eastern orders, did not, happily, have any bearing on the market, although the Japanese, who were such prominent buyers in 1904, were but little in evidence during the season just ended. The American demand has continued a dominant feature in our market, but many clips usually within their range were so affected by the protracted dry autumn in Victoria, and the disastrous bush fires in Riverina, that they would not touch them, and in consequence their purchases have not reached last year's figures. However, when high-class merinos or attractive crossbred parcels, particularly in sound condition, and of good length, were available, their competition elevated them to highly satisfactory prices. During the year, the rearrangement of sales in Victoria forecasted in our last Review was discussed, and at the outset in October it was decided to sell on four days weekly only, *i.e.*, three days in Melbourne and one in Geelong, instead of five as formerly. Quantities offering, however, were not restricted, and no relief was afforded from the heavy offerings, and notwithstanding the increased quantities disposed of, the sales were concluded in January. It was generally conceded at the termination of the sales, notwithstanding the satisfactory realisations effected, that the selling season should be extended, and a definite arrangement has now been arrived at by Melbourne and Geelong, restricting quantities to be offered, and the effect is expected to be that weekly sales will in future be held continuously from early in October to the end of February.

For some years, in the face of the huge increase in colonial wool sales, it has become the fashion of our London competitors to decry local realisation, and circulars are being continually received by our friends pointing out the alleged losses suffered by selling in Australia. The favourite argument, and indeed the only one, used by our London friends, appears to be that the average realisation per bale of Australian wool in London is higher than in Melbourne. The fact well known to them that of the total offerings in London of Australian wools, as much as one-third consists of scoured and slipe wools, is not disclosed in their circulars, and further careful omission is made of the fact that the greasy wool from Australia sold in London is almost wholly made up of straight-running clips, with the lower sorts out, while the Australian sales average includes a

very small proportion of scoured and slipe wools, and has to carry all the greasy sorts, including the whole of the badly classed and low grade farmers' lots, the aggregate of which pulls down the Australian average to a large degree. Of course it is easy to understand the reason of the London brokers attacking the colonial sales, inasmuch as their growth means loss of business to the English market, but owners do not allow sentiment to come in where their interests are concerned, and have been quick to recognise that the colonial markets obtain for them (taking a period of years) fully the equivalent of London markets, with a quicker realisation, which, after all, is the crux of the whole business.

The Clip.

From whatever point of view the clip of 1905 may be judged, certainly by those most competent to express an opinion, and who will have to deal with it after quittance by growers, the term "rotten" would appear to have been the one in most general use, and to a very large extent was fully justified.

From the outset, when the earlier clips arrived, this tenderness and break in the staple was very apparent, and the question was frequently asked, "Is this what we may expect of all the clips?" Unfortunately, as the season progressed, the reply was given in the affirmative by the clip itself, for rarely have we seen a staple which, although to the eye appearing so attractive, proved on handling so bitterly disappointing. Apart from this defect, broadly speaking, the clip was thinner, and lacked the density of its predecessor. Undoubtedly the long summer and dry autumn experienced (during which the growth of wool was much retarded), followed by very copious rains in April, May, and June, bringing a superabundance of green feed caused the decided break in the staple, from which all the clips have more or less suffered. Added to this were the disastrous bush fires, perhaps the worst on record, which occurred in Eastern Riverina, and over a large area of the Western district of Victoria. The hogget and younger wools were most adversely affected.

The condition generally, if judged by individual returns per head, was certainly lighter than that of the previous year, but there is no doubt that, from a user's point of view, owing to the wool being tender and thin, there was not the yield of "Top," which, after all, is the main factor in determining its value. Taken all round, the clip from Queensland was good, although many of the wools from Central district were in poor condition, being thin, somewhat impoverished, and presented anything but an attractive appearance. The Darling district, and in fact the whole of the Western division of New South Wales, experienced an ungenerous season; the clip, however, was of exceptional softness, and finer than previously. Tasmania, on the other hand, produced a clip if anything a shade lighter in condition, and which differed materially from the main Island wools, inasmuch as it was sound; in other respects, as alluded to in our last Review, the tendency in the greater proportion of clips is still to a more robust type.

In marked contrast to the fleece portion was the production of lambs' wool. Both in quantity, quality, length, and general attractiveness the 1905 clip has had few to equal, certainly none to excel it, its comparative freeness of all vegetable matter being a special feature, that from merino lambs teching as high as 20½d.

Annual Export of Wool from Australia for the past five years from 1st July to 30th June.

State.	1904-1905.	1903-1904.	1902-1903.	1901-1902.	1900-1901.
	Bales.	Bales.	Bales.	Bales.	Bales.
Victoria	365,368	314,218	324,404	403,096	391,841
New South Wales	597,174	457,160	468,826	629,041	584,848
South Australia	108,844	98,447	96,623	111,705	116,949
Queensland	78,708	60,031	45,727	81,151	99,239
Tasmania	10,793	16,289	16,888	14,790	23,772
West Australia	40,893	33,656	30,835	32,315	29,680
Total	1,201,780	979,801	983,303	1,272,098	1,246,329
New Zealand	387,209	376,532	428,768	414,213	389,360
Total, Australasia ...	1,588,989	1,356,333	1,412,071	1,686,311	1,635,689

Total Sales and Exports from 1897 to 1906 (inclusive all Australian States except New Zealand).

Year.	Total Exports.	Total Sales.	Percentage Sales to Exports.
	Bales.	Bales.	
1897	1,477,217	767,340	52
1898	1,301,034	772,300	59
1899	1,261,577	788,144	62½
1900	1,198,621	840,323	70
1901	1,246,329	659,438	53
1902	1,272,098	948,839	74½
1903	983,303	725,466	73¾
1904	979,801	747,970	76¼
1905	1,201,780	924,857	77
*1906	1,400,000	1,149,443	82

* Estimated.

The exports are to the 30th June in each year, the sales for the season ending 28th February.

EXPORTS.

The following table shows the shipments from Australasia from the 1st July, 1905, to 28th February, 1906, with those for the corresponding period last year:—

State.	Season. 1905-06.	Season. 1904-05.	Increase.	Decrease.
	Bales.	Bales.	Bales.	Bales.
Victoria	382,890	353,918	28,972	...
New South Wales	659,197	527,891	131,306	...
South Australia	117,512	106,143	11,369	...
Queensland	79,604	67,385	22,219	...
West Australia	39,503	40,321	...	818
Tasmania	14,463	9,596	4,867	...
Total, Australia	1,293,169	1,105,254	198,733	...
New Zealand	274,420	282,667	...	8,247
Total, Australasia ...	1,567,589	1,387,921	189,668	...

Wool Classing.

We would again urge our friends to give more attention to the classing of their clips that come to this market, although we are glad to note much improvement on previous years. There is no direction in the wool-growing industry where the extra care is more amply repaid, and we repeat our advice in this issue. A matter of great importance to growers, and one which has given rise to considerable complaint from the buyers' point of view for many years past, has been the faulty and careless manner in which some clips of known excellence have been handled in the shearing shed. This defect in the general get up of clips is, to a very great extent, attributable to insufficient accommodation being given to the classer to deal with the various grades and conditions of wools, also want of expert knowledge and the difficulty arising through not being able to procure good reliable table hands. The principal ground of complaint in the past has been the almost total neglect to condition of wool, due regard being rarely given to the classing of heavy, yolky, and discoloured fleeces, which should always be made a lot by themselves. As the yield of wool is the most important thing to consider in estimating the true value of the raw material, it will readily be understood how essential it is that the condition of wools in their various classes should be even throughout. Want of attention in this particular, although quality and length of staple may be the same, often prejudices the sale to a great extent. In some clips, when tenderness is not very pronounced, but still is noticeable on examination, it is as important, as in the case of ill-conditioned fleeces, that a separate class should be made for tender wool. We have frequently had brought to our notice cases in point when, through neglect in this essential detail, the mere fact of a few weak fleeces being apparent (though bright and of good length) has had the effect of limiting competition, and has thus been detrimental to the sale to as much as a full penny per lb. A common fault, when dealing with this tender wool, is that, in many instances, combing wools of good length, but at the same time showing a break in the staple, are not only wrongly branded "clothing," but are also mixed with a short, fine, true clothing type of wool. This is a fatal mistake in classing, and should not be permitted on any account, because no purchaser of short wools requires (as is often supposed) a combing wool, though tender, to suit the purposes of a clothing type, and for this reason it is essential that these two totally different wools should be kept quite separate.

Another salient point, and one which some growers completely lose sight of, is the faulty manner in which the necks, broken, and pieces are skirted and trimmed up. It should be taken into consideration that very often the necks and broken contain some of the lightest and most valuable portions of the clip (except in seasons when burr and seed are very prevalent), and if careful attention were given to the picking and taking off of all locky and fribby ends, they would realise nearly as much as the fleece. When belly wool is of good length, and for this reason can be used as a combing wool, attention might to advantage be given to its careful trimming and skirting, which would amply repay the little extra outlay in this direction. Perhaps even to a greater extent is the wide disparity displayed in the classing of crossbreds, and frequently does it occur that a would-be buyer of apparently a straight line of crossbreds leaves it severely alone on account of its irregularity as regards quality and length.

In consequence of the prevalent irregularity in classing of crossbreds, the Wool Brokers' Association, at the instigation of the buyers, were compelled the last four seasons to show every alternate bale reverse end up. This course was followed to enable the buyers as far as possible to discover which quality predominated, and where coarse grades were most in evidence the finer fleeces were sacrificed to an undue extent. These remarks apply equally to large or small lots, and we advise our friends to give more attention to these points than hitherto. The system in vogue with us, and one which we strongly recommend to our constituents, is our present custom of interlotting the bales of small growers when of similar type, condition, and value. By thus making a large line of wool, stronger competition at enhanced values is certainly assured. The argument which has so often been advanced in the past, that it does not pay to grade small lines in wools, because in doing so star lots of one to three bales are made, does not hold good, as by the above-mentioned system any possible loss on that score is nullified.

The Pastoral Outlook.

Since the publication of our last Review, the pastoral position has been much varied. In May and June, good rains fell over portions of New South Wales, and patchy rain in Queensland. This, however, was succeeded by very hot and dry weather, with the result that the whole of Queensland and the greater portion of New South Wales were very dry, a condition only alleviated by the copious rains just fallen throughout the greater portion of the States.

Excepting over isolated portions of the interior, all anxiety is now at an end, as feed for many months should be abundant, and the result of the lambing season which is at hand is practically assured. Prices in the fat stock market receded somewhat from the higher prices ruling in 1904, caused partly by the continued dry season, compelling owners to sell freely, and partly by increased supply. There is now an extensive withdrawal of store stock from the market as the immediate effect of the rain. A conspicuous feature in the live stock market during the past season was the continued development of trade in fat lambs for export, a trade which has now reached proportions not previously known in Australia. For pastoral properties in favoured districts there has been a strong demand, and many have changed hands during the past twelve months, mainly for the purpose of cutting up into smaller holdings, and for agriculture. In this connection there appears to be more land in suitable districts offering at a fair price for the purpose of closer settlement than can readily be absorbed.

LOCAL MARKETS' REPORTS.

WIGMORE'S MONTHLY REPORT.

H. J. Wigmore & Co., of Fremantle, Perth, Kalgoorlie, and Northam report as follows in connection with their daily auction sales of chaff and grain at Perth and Fremantle railway yards for month ending Friday, 6th inst.:—

Chaff.—During the month erratic conditions have prevailed at Perth railway yards, although, as we have predicted for many months past, there is no material alteration to report in prices, and these close practically the same as when we last reported to this journal, viz.: prime green wheaten (scarce) £4 15s., f.a.q. wheaten £4 10s. to £4 12s. 6d., good medium wheaten £4 5s. to £4 7s. 6d., medium wheaten and cow chaff £3 12s. 6d. to £4 2s. 6d. Prime oaten (very scarce) £4 12s. 6d., good sound oaten £4 2s. 6d. to £4 1s., oaten straw chaff £3 10s. Seeding operations have so far only been responsible for a very slight falling off in supplies, and although on two or three consecutive days probably not more than an average of 10 trucks has been maintained, say, on the fourth day, a heavy yarding would be experienced. Buyers would then fill in their requirements and on succeeding days could afford to be apathetic. During one of these temporary scarcities f.a.q. chaff at auction realised £4 15s., and we have to report a sale made by us *ex* store of one or two trucks f.a.q. wheaten chaff from Greenhills at £5 per ton, this being by far the highest price realised in Perth or Fremantle for some months. This price could not be repeated at the present moment, but we have no doubt that with light supplies, which should be tolerably certain until seeding operations are completed, prices will again advance to the vicinity of £5. A considerable factor, however, in this market is the South Australian chaff which can be landed here at anything from £4 10s. to £4 12s. 6d. South Australian chaff is constantly arriving, and this must practically be recognised as the controlling force in the market. Without this, and assuming that chaff would arrive on a small scale during seeding time, there is no doubt that extremely high prices would rule.

Advances to Farmers.—We are in a position to make liberal cash advances on chaff or hay held by farmers, and are prepared to send representatives to any part of the country with a view to effecting same.

Wheat.—The markets in the Eastern States are firmer, Adelaide quoting 3s. 2½d. to 3s. 3½d. f.o.b. Melbourne; for shipping, parcels being about the same figure. These quotes of course are for f.a.q. Local wheat has also firmed, and we have sold up to 3s. 8½d. for prime milling quality this week. We believe we could secure 3s. 9d. privately for a few trucks, and invite correspondence from holders accordingly. We are also in a position to deal satisfactorily with smutty and pinched wheat, and have sold the former *ex* store this week at 3s. 5d., for which, when stored, the highest price obtainable was 3s. We recommend consignments of prime milling wheat to us at auction at Perth.

Oats.—There is very little alteration to record in the Eastern States, but there is no doubt in our opinion that the Victorian market must firm. Latest advices from Melbourne are to the effect that Algerian milling oats especially are scarce, and are likely to see 2s. 5d. or even 2s. 6d. Seed oats have also been sold in Melbourne as high as 2s. 6d. f.o.b. We are well placed with seed oats, and invite correspondence accordingly. Good feed oats f.o.b. Melbourne are quoted at 2s. 1½d., and on spot 2s. 5½d. to 2s. 6d. for whole, crushed 1d. higher. Stout oats slightly firmer in Tasmania, value 2s. 4½d. f.o.b. On spot 3s. to 3s. 1½d.

Flour.—We quote Thomas' "Standard" flour f.o.b. Port Adelaide £7 7s. 6d. sacks, £7 12s. 6d. quarters for prompt and forward shipment. For Thomas' Northam

"Standard," price on rails Northam, prompt or forward business, £8 sacks, £8 5s. quarters. Although there is no alteration in prices a firmer tone is evident in the flour market, and we certainly look for higher prices in the near future.

Bran and Pollard.—Sydney is still the cheapest market for these commodities, respective prices being 9d. and 9½d. f.o.b. On spot, bran is worth £5 5s. and pollard £5 7s. 6d. in truck loads on rails Fremantle. Our Northam stocks are light. We quote present prices £5 10s. and £5 12s. 6d. on rails that centre.

Bran Bags.—We are very well placed with these and invite correspondence from those requiring.

Kalgoorlie Chaff Market.

There is very little alteration to report in this market. Moderate supplies arriving daily. Nominal value for prime green wheaten £5 7s. 6d., with possibly an extra 2s. 6d. for exceptionally good sample. Lower qualities do not create a keen demand.

Messrs. PATERSON & CO.'S (Ltd.) REPORT.

Messrs. Paterson & Co., Ltd., report as follows in connection with their produce sales for the week ended 10th March, 1906:—

Chaff.—Chaff has been in better supply, and prices, more especially for medium qualities, have gone back considerably. Chaff selling at £4 2s. 6d. a week ago was to-day knocked down at £3 10s. and £3 15s. Prime samples of green wheaten seem to be holding their own from £4 10s. to £4 12s. 6d., but no doubt it is only a matter of a few days when these values must come back, at the rate at which consignments are flooding in. Oaten chaff of really prime sample is firm at £4 10s., but the trucks arriving during the week have in most cases been damaged by wet and badly cut. We have to report extensive forward business at full market rates, and also considerable business in stack advances. We deal with farmers in any way which suits them, either by advancing on stacks, buying outright in the stack or on rails, or by selling on commission for their account. Country advices show that a big quantity of chaff is at present being cut for prompt marketing, so that we cannot advise our clients to forward consignments unless present prices are satisfactory. Of course, it is just possible that the present prices are the best we may see this year, as we find that the associated shipping companies are continuing their reduced rate for chaff from Adelaide to Fremantle until July next, which means that it is very improbable prices will rise beyond the imported article, which, we are bound to say, is better cut, generally speaking, and is as good quality of hay as we have in Western Australia. That is, of course, speaking of the samples which are arriving up to the present. It may be, of course, that their market may firm in price, as New South Wales is at present taking a considerable quantity, but in the face of the crop of hay South Australia has this year, we cannot reckon upon a rise of any size, as matters appear at present.

Wheat is in slightly better inquiry at present, owing to the lack of supplies recently, but it is, after all, only a fowl-feed inquiry, and has little really to do with the market price for prime milling. Smutty wheat was bid up to 3s. 6½d. per bushel, and we can recommend consignments of this sort, and fair average quality, so long as the market is not rushed. London market cables a steady market at 30s. 9d. per quarter, and Eastern advices quote 3s. 1d. to 3s. 2d. per bushel f.o.b. for shipping parcels.

Oats.—Algerians are easy in Melbourne at 2s. 0½d. to 2s. 1½d. for feed sorts. Spot prices are 2s. 5½d. whole and 2s. 6½d. crushed, at which price we have extensive business to report during the week. White oats are quoting at 3s. 2d. whole and 3s. 3d. crushed, supplies being mostly drawn from Tasmania, as New Zealand "B" grades are still slightly over Tasmanian costs.

Bran.—This has eased in Sydney, Melbourne, and Adelaide, and the local market has also followed the drop in prices. We have contracted to sell a very large quantity during the last fortnight, and are still open to quote during the year at low prices for spread delivery. We are now quoting £5 2s. 6d. rails Fremantle, and equivalent prices on rails York or Northam.

Pollard.—This has fallen in Eastern States, in conjunction with bran, but spot market is slightly higher at £5 10s. on rails Fremantle.

Straw.—The market has been well supplied, and £2 5s. is the utmost that could be looked for for any quantity. Single trucks supplied separately would probably realise £2 10s. Four or five trucks would easily put this market back.

Messrs. Paterson and Co., Ltd., report as follows in connection with their produce sales at Perth railway yards for the week ending 17th March:—

Chaff.—There is little change since our last weekly report. The market has been steadily supplied all the week, and f.a.q. and prime chaff has held up very well. Medium sorts have eased a little, and the difference between the qualities is now slightly more marked. To-day a prime truck realised £4 15s., and there is no reason to doubt that values for really good quality should meet this figure consistently during next week. Cow chaff is now selling at from £3 10s. to £3 15s., and medium sorts £3 17s. 6d. to £4 2s. 6d., good wheaten realising £4 5s., f.a.q. £4 7s. 6d. and £4 10s., and prime green wheaten £4 12s. 6d. and £4 15s. During the week a 50-ton parcel of imported chaff arrived by the s.s. Bombala, and sold, we believe, at £4 15s. per ton, which shows a small profit to the importer. The quality of the chaff was reported to be good, but a portion of the consignment was heated. One thing in which there is room for great improvement in the local samples is the cutting, and in this our chaff compares unfavourably with the South Australian. In view of the fact that reduced steamer freights are now offered on chaff, as far forward as July, there seems little probability of the local market obtaining over £5 at any time during that period, as an advance to that figure would immediately bring more imported chaff on the market. This being so, the present market may be as good as any during the year, with the exception of occasional little shortages, when values may be raised 5s. per ton. South Australian sellers are quoting chaff forward for the next six months at equivalent to £4 10s. Fremantle. Oaten chaff is in fair demand, and also in fairly good supply. Ruling prices are £4 7s. 6d. to £4 10s. for f.a.q. down to £4 2s. 6d. for medium. Farmers seem to be holding firmly for hay in the stack at prices ranging from £2 10s. to £3 per ton, according to position and quality, and we have steady business to report for the week. We have also negotiated advances for a fair amount, and will be pleased to hear from other farmers requiring this accommodation.

Wheat.—Few trucks have been yarded during the week, in conseqence of which prices have hardened a little, and values can now be placed at 3s. 7d. per bushel for fair average quality samples, smutty lines selling at slightly lower figures, according to sample. London market is quiet, and there is no change to report in the Eastern markets, where values seem steady at recent quotations. Several mills are still open to buy at market rates, and we invite correspondence, more especially from holders of fairly large parcels. A fairly large shipment from South Australia is due to arrive, we believe, next week, at a price equivalent to 3s. 8d. on rails Perth.

Bran and Pollard.—The advent of magnificent rains in Victoria and New South Wales has dispelled all fear of drought in these States, in consequence of which speculators, who were holding large stocks, and also the millers, are now quoting much finer prices f.o.b. Sydney and Melbourne. The Adelaide market reports little change, and in fact was drawing from Sydney up till a few days ago. Sydney quotation is now 8¾d., and firm business can be done at Melbourne at 9d., with every prospect of lower prices during the week. Spot stocks are offering freely at £5 2s. 6d. on rail Fremantle, and country quotations have dropped into line. Pollard is practically in line with bran, except on spot, where slightly higher values are obtainable, £5 7s. 6d. being the quotation on rails Fremantle, with equivalent prices country stations.

Oats.—Victorian Algerians are easing in sympathy with offal, although speculators are making a determined effort to hold prices, but it seems fairly certain that lesser values will have to be taken in the near future. The West Australian market has never responded to the high rates quoted in Victoria, owing to the accumulations on spot. We have steady sales to report at 2s. 5½d. whole, and 2s. 6½d. for locally-crushed stout, heavy, feed Algerians. Melbourne crushed oats are not handled by us, and all our crushing is done under our own supervision on our own premises. White oats are now represented by Tasmanians only, New Zealand oats being unprocurable at equivalent values. Old stocks in New Zealand are practically now worked off, and cheap freights to the United Kingdom have been the cause of the rapid clearance.

Spot quotations are as follows:—Whole oats, 3s. 2½d. per bushel; crushed white oats, 3s. 4d. per bushel.

Straw.—Two or three trucks of straw have been forward since last reporting, and top value received has been £2 10s. per ton. To-day one truck was passed in at £2 7s. 6d. The market is easily filled with this commodity, and prices seem to be gradually weakening.

Wire-netting.—We have to advise having been appointed sole agents in Western Australia for Messrs. Lysaght Bros. and Co., Ltd., the well-known Sydney firm of wire-netting manufacturers, and within the little time since the appointment we have done considerable business. Preferential rates of freight in this line put us in the position to quote this well-known brand of netting at prices which cannot be obtained by the foreign-made article, besides which it is well known that Messrs. Lysaght Bros. make the best wire-netting used in the country. Special quotations can be given for mile lengths, and any inquiries for prices will have our prompt attention.

Messrs. Paterson and Co., Ltd., state: Since our last report business at Perth railway yards and privately has been active, with a good deal doing:—

Chaff.—Supplies during the week have been decidedly on the large side, there being two occasions when over 40 trucks of chaff were offering. Prices, on the whole, have remained wonderfully steady, considering the heavy yardings, and but for the fear of South Australian chaff coming in it seems probable that prices would now have been on a higher level. As it is, however, there is nothing to warrant South Australian chaff coming in, and we do not look for anything but small quantities, unless Perth market rules at something like £5. We understand that there is a shipment of about 100 tons South Australian chaff now on the water, but on present basis of prices it is not likely to do much harm to the local article. On the whole, the quality of this week's chaff has been poor, there having been very few trucks indeed of really prime green wheaten. This class of chaff would realise £4 12s. 6d. to £4 15s., while fair average quality wheaten has been selling at £4 5s. to £4 7s. 6d., and good oaten chaff at the same price. Weedy and irregular wheaten chaff has been selling at £3 17s. 6d., with cow chaff down to £3 15s. The number of trucks passed in at the auctions has not been very great, although to-day 15 were taken off the market, salesmen's ideas of value not having been reached. It seems probable that supplies will continue to come forward freely for the next week or two; but as soon as farmers get to work on their land there may be a falling off, which should help to steady prices. During the last week we have sold several large parcels of chaff, and Northam values range at £4 and £4 5s., according to quality and delivery.

Oats.—New Zealand telegraphs that stocks of old crop are exhausted, and it is likely to be some weeks yet before new oats are on this market. At present Tasmanians of fairly good quality can be bought at 3s. 2d. whole and 3s. 3d. crushed, while Devonport figure is 2s. 7d. Algerians have remained very steady in Melbourne at 2s. 1d. to 2s. 1½d. for Government grade oats. This is above the equivalent of Fremantle market, where 2s. 5½d. to 2s. 6½d. are the quotations for whole and crushed respectively.

Bran and Pollard.—There has been a smart advance during the week, bran being quoted to-day at 9½d. Sydney, 10d. Melbourne, and 10½d. Adelaide, while values a week ago were about a ½d. lower. On this market bran is quoted at £5 7s. 6d. to £5 10s., while at the beginning of the week it could be bought at £5. The future of the market for offal is almost entirely a matter of weather. Rains have fallen in the Eastern States, but they are probably too early to do much good in the way of easing the demand for offal.

Wheat.—There has been very little wheat forward to auction, and values remain unchanged at about 3s. 7d. Perth, while country price is 3s. 3d. to 3s. 3½d., according to railage. London market is reported as rather firmer, but there seems to be very little life in wheat generally. In the Eastern States, prices have moved up slightly, but there does not seem to be a prospect of any material advance, so far as present indications go.

Wire-netting.—As agents for Messrs. Lysaght Bros. and Co., Ltd., of Sydney, we are able to announce a material reduction in price, and buyers of netting will be furnished with the latest particulars, with revised discount list, on application to us.

Messrs. Paterson and Co., Ltd., report as follows in connection with their produce sales at Perth railway yards for the week ended 31st March:—

Wheat has firmed on the London market to the extent of 6d. per quarter of 480lb. on former c.i.f. quotations. Consignments to Perth have been few, and as a consequence values have seen a rise of 1d. per bushel during the week, prices now quoting at 3s. 8d. per bushel for prime quality rails Perth. We would advise consignments to Perth and Fremantle, as just at present both markets could take a few trucks without decreasing values. Slightly smutty and pinched lines are also in good demand at from 3s. 6d. to 3s. 7d. per bushel, and samples containing smut to a fairly large degree would, we think, at present realise 3s. 4d. to 3s. 5d. per bushel. Eastern markets are steady at late rates, with a firm tone.

Chaff.—During the week supplies have been short, and only the fact that fair stocks have been held in Perth has prevented prices rising to a greater extent than has been experienced. The quality of consignments has been principally composed of medium lines, fair average quality and prime chaff having been but poorly represented. To-day (Saturday) values reached £4 12s. 6d. for prime quality, which makes the rise for the week practically 2s. 6d. per ton on good lines; medium sorts remaining steady at from £3 15s. to £4 per ton; cow chaff selling as low as £3 10s. Good medium lines have been realising up to £4 5s., and at this price and £4 7s. 6d. for slightly better samples, the most of the business has been done for the week. We have to report extensive business from our Northam branch; so much so, that we have had to cease quoting to enable our cutters to get abreast of orders. Most of this has been going to the back country beyond Kalgoorlie at full market rates, which have been fully 5s. per ton ahead of Perth equivalent values. We have also made extensive contracts for the season at an advance on recent rates, besides further business in hay in the stack. During the week at Perth we have sold a fair number of trucks at prices ranging from £3 15s. to £4 10s., at which latter price we sold both oaten and wheaten, fair average quality samples; and we have little hesitation in advising that £4 12s. 6d. or even £4 15s. can be secured during the on-coming week for prime samples. Oaten chaff has been fairly well represented at prices equivalent to those being realised by wheaten, which is out of the ordinary course of things, wheaten chaff as a rule selling at 5s. per ton above oaten for equivalent qualities. We can recommend consignments of both lines to Perth, Fremantle being at present over-supplied.

Oats.—Algerians have been in good demand during the week, and we have to report extensive sales up to 2s. 6d. whole and 2s. 7d. per bushel crushed for stout, heavy feed of good weight and colour. These are crushed locally in our own mill at Fremantle, and are giving the utmost satisfaction. Melbourne crushed oats have been quoted slightly cheaper, but the difference in price does not cover the difference in quality. Present local rates are below the equivalent of f.o.b. quotations, but as extensive rains are reported in Victoria, New South Wales, and Queensland the probabilities are that oats will see a material drop, which precludes any possibility of higher prices on spot stocks for the present. Tasmanian white oats have been in good demand during the week at 3s. 2d. whole and 3s. 3d. crushed, with fair stocks held, and a steady market. New Zealands are scarce, and cannot at present be landed at rates equal to Tasmanians.

Bran has been well held in the Eastern States, holders being encouraged by the dry weather existing until recently, but a weakness in price has been shown in quotations from Sydney, and there is little doubt that a drop is imminent. Rains have fallen during the week all over New South Wales; and as the offal market is controlled almost entirely by weather conditions, we think it highly probable that further reductions may be looked for. On spot bran sold down to £5 per ton, afterwards lifting to £5 5s., which can be taken as the present market for imported bran, local bran selling at equivalent prices country stations.

Pollard has been in full demand at slightly higher figures than bran.

Straw.—Straw has been sold during the week at £2 10s. per ton rails Perth, and at this figure further business could be done during the on-coming week. We would certainly recommend consignments of this commodity, as the demand here is good.

Local barley and oats have not been seen on the market during the week, and the demand is being principally supplied from stocks held in store of the former and the imported article with regard to the latter.

W.A. GENERAL PRODUCE COMPANY'S REPORT.

Weekly market report of the W.A. General Prodace Company, 245 Murray Street, Perth, for the week ending 4th April, 1906:—

Business: During the past week fairly active supplies; very regular values likewise; detail particulars as follows:—Bacon very scarce on spot, and values rising rapidly in the East. Hams: Well-known brands continue being scarce; demand been extra strong. Butter: Telegraphic news to hand indicates increased supplies, with Queensland and New South Wales offering freely; values likely to drop materially; on spot, fairly scarce for the time. Cheese in exceptionally good demand; values still keeping high. Eggs: Supplies of local fresh not equal to the demand; Adelaide lots practically supplying requirements. Potatoes: Local new in good demand; Tasmanian are not giving satisfaction, owing to small size; traders in general very discontented with them. Onions: Consignments arriving in very bad order, causing a lot of trouble. Chaff: Fair supplies, forward meeting with good demand and selling very freely at quotations. Fruit: Fairly large quantities of apples still coming forward; values in general very satisfactory. Vegetables in very active demand; values firming considerably. Poultry: Full supplies; values continue being depressed.

Farm and Dairy Produce.—Bacon: Hutton's, 9½d. to 9¾d. per lb.; Newnham & Barnes', 8¾d.; others, 7d, Hams: Hutton's, 1s. 1½d. per lb.; others, 9d. to 1s. per lb. Butter: Euroa, 1s. 1½d. per lb.; Millawa, 1s. 1d. per lb.; Hansen, 1s. 1d. per lb. Lard, in bladders, 7½d. per lb. Cheese: Loaf, 8½d. per lb.; medium, 8d. per lb. Eggs: Suburban, fresh, 2s. 3d. to 2s. 9d. per doz.; country lots, 1s. 1d. to 2s. per doz. Potatoes: Local, new, prime, 12s. 6d. to 16s. per cwt.; seed, 14s. per cwt.; Tasmanians, £10 10s. to £11 per ton. Onions: 8s. 6d. per cwt. Chaff: Prime, green, £4 5s. to £4 12s. 6d.; medium, £3 10s. to £4. Bran and Pollard: £5 15s. to £6 5s. Flour: Eureka, Thomas', £8 15s. to £9; Peerless, Premier, £8 10s. to £8 15s. Oats: Algerian, 3s. 10d. to 5s.; New Zealand, 3s. 10d. to 4s. Wheat: Truck lots, 3s. 8d. to 3s. 9d. Oil-cake: £9 10s.

Fruit.—Oranges, Italian, 21s. to 22s. 6d. Lemons, Italian, 22s. to 25s.; local, 5s. to 8s. Passion Fruit, 3s. 6d. to 6s. 6d. per case. Grapes: Muscatels, 6s. to 8s. 6d. per case; Doradillos, 3s. to 5s. Wortley Hall, 4s. to 7s. 6d.; Centennials, 6s. to 11s,; other, 3s. to 3s. 6d. Figs, 3s: to 4s. 6d. Peaches, 6s. to 14s. 6d. per case. Apples: Prime dessert, 10s. to 14s. 6d.; medium, 6s. 6d. to 8s. 6d.; cooking, 2s. 6d. to 6s. per case. Pears: Prime eating, 12s. to 16s.; medium, 7s. to 8s.; cooking, 4s. to 6s. Quinces, 3s. 6d. to 5s. per case. Pomegranates, 3s. to 4s. 6d. per case.

Vegetables.—Cabbage, 8s. 6d. to 16s. 6d. per cwt. Cauliflowers, 4s. 6d. to 10s. per dozen. Carrots, 9d. to 1s. 10d. per dozen bunches. Parsnips, 1s. to 2s. per dozen bunches. Turnips, white, 1s. to 1s. 10d. per dozen bunches; Swedes, 1s. 6d. to 2s. 6d. per dozen bunches. Beans, French, 2d. to 3d. per lb. Peas, green, 3d. to 4½d. per lb. Marrows, 1s. 6d. to 3s. 6d. per dozen. Pumpkins: 4s. to 5s. 6d. bugles; 5s. to 7s. 6d. ironbark. Rhubarb, 1d. to 2½d. per lb.

Salads and Herbs.—Lettuce, 1s. to 2s. per quarter bag. Spring onions, 3d. to 8d. per bundle. Beetroot, 9d. to 2s. per dozen bunches. Cucumbers, 8d. to 2s. 6d. per dozen. Tomatoes: Prime green, 4s. to 7s. per case; medium, 3s. to 4s.; inferior, 1s. 6d. per case. Celery, 6d. to 3s. per dozen heads, according to quality. Radishes, 3d. to 6d. per dozen bunches. Thyme, marjorum, and sage, 1s. 6d. to 2s. per dozen bunches. Mint and parsley, 1s. per dozen bunches.

Poultry (for killing).—Fowls, 3s. 1d. to 4s. 6d. per pair. Chickens, full-grown, 4s. to 5s. 6d. per pair. Ducks, 3s. to 4s. 6d. Turkeys: Gobblers, 10s. to 15s. per pair; hens, 7s. to 10s. per pair. Geese, worth 7s. to 9s. Pigeons, 1s. 6d. to 1s. 9d. per pair. Game—Black duck, worth 2s. 6d. to 3s. 6d. per pair. Teale, 1s. 6d. to 2s. per pair. Hardhead, 2s. per pair. Bluewing, 2s. per pair. Mountain duck, 3s. per pair. Wild turkey, 7s. 6d. per pair.

Carcase Meat.—Pork, medium weights, 4½d. to 6d. per lb.

Sundries.—Corn sacks, secondhand, 4s. 6d. per dozen. Bran bags, secondhand, 3s. 3d. per dozen. Bone-dust, £7 10s. per ton. Bonemeal, £8 per ton. Phosphate, £4 5s. per ton. Superphosphate, £5 10s. per ton. Guano, ammoniacal, £4 10s. per ton. Kainit, £4 15s. per ton. Nitrate of superphosphate, £6 10s. per ton. Special vegetable manure, £7 per ton. Potato, onion, and other root manures, £7 10s. per ton. Thomas' phosphates (English grades), £4 5s. per ton. Nitro-superphosphate, £6 10s. per ton.

THE CLIMATE OF WESTERN AUSTRALIA DURING MARCH, 1906.

The month has been hotter and drier than usual.

At Perth the excess of the mean maximum over that for previous years was 2°·5, and the absolute maximum, 104°·3, was the highest that has yet been recorded at the Observatory in March.

The excessive heat was most noticeable in the tropics, especially inland, the mean maximum at Nullagine, 104°·8, being 9°·8 in excess of the average for previous years.

The greatest mean maximum temperature was 107°5, at Marble Bar, and the absolute highest, 112°·0, at Carnarvon, which was the highest ever recorded at that place for March.

Pressure was about normal throughout.

Rainfall was everywhere below the average for previous years. In the tropics it has been very light for the whole season, the deficiency being specially noticeable in the North-West division, where the drought is becoming rather serious.

W. E. COOKE,
Government Astronomer.
Per E. A. W.

The Observatory,
Perth, 5th April, 1906.

The Climate of Western Australia during March, 1906.

	Locality.	Barometer (corrected and reduced to sea-level).				Shade Temperatures.									Rainfall.		
						March, 1906.					* Average for previous Years.						
		Mean of 9 a.m. and 3 p.m.	Average for previous years.	Highest for Month.	Lowest for Month.	Mean Max.	Mean Min.	Mean of Month.	Highest Max.	Lowest Min.	Mean Max.	Mean Min.	Highest ever recorded.	Lowest ever recorded.	Points (100 to inch) in Month.	Wet Days.	Total Points since Jan. 1.
North-West and North Coast:	Wyndham	29·830	29·801	29·988	29·603	99·6	80·3	90·0	105·0	73·0	94·7	78·2	104·2	70·0	285	6	1,367
	Derby	29·857	29·829	29·986	29·655	99·4	78·9	89·2	103·6	72·8	95·5	76·8	105·0	64·0	27	1	993
	Broome	29·843	29·813	29·989	29·664	96·7	79·4	88·0	104·4	70·4	92·9	76·7	102·5	62·8	*Nil*	...	945
	Condon	29·838	29·842	30·007	29·674	97·6	71·9	84·8	108·3	60·8	93·2	73·2	104·0	56·5	*Nil*	...	220
	Cossack	29·904	29·820	30·144	29·850	100·7	73·3	87·0	107·2	69·0	96·1	76·4	111·2	65·0	*Nil*	...	105
	Onslow	29·884	29·830	30·025	29·739	98·0	72·3	85·2	109·0	65·0	96·8	73·7	112·0	63·0	1	1	91
	Winning Pool ...	29·866	...	30·019	29·691	104·3	71·3	87·8	111·6	62·0	...	...	...	...	10	1	73
	Carnarvon	29·916	29·895	30·089	29·720	88·1	70·3	79·4	112·0	60·4	89·7	70·0	110·3	56·0	*Nil*	...	30
	Hamelin Pool... ...	29·911	29·891	30·102	29·767	96·3	66·1	81·2	111·2	57·6	95·2	66·9	112·8	50·6	*Nil*	...	*Nil*
	Geraldton	29·988	29·976	30·168	29·718	85 0	64·4	74·7	110·0	51·1	83·4	62·0	107·0	48·8	*Nil*	...	40
Inland:	Hall's Creek	29·867	29·872	30·031	29·673	100·5	70·7	85·6	105·0	56·8	93·5	71·9	106·8	54·8	15	3	395
	Marble Bar	...	...	...	...	107·5	71·9	89·7	111·8	69·0	102·4	75·3	114·8	59·6	16	1	453
	Nullagine	29·869	29·852	30·073	29·691	104·8	68·3	86·6	109·6	60·0	95·3	70·4	110·0	54·9	*Nil*	...	477
	Peak Hill	29·880	29·875	30·050	29·730	100·0	73·2	86·6	107·0	60·0	92·8	69·1	103·0	52·9	*Nil*	...	22
	Wiluna*	29·900	29·877	30·086	29·652	95·7	67·0	81·4	102·8	56·8	93·8	65·4	103·8	49·3	17	1	266
	Cue	29·938	29·912	30·096	29·693	97·0	69·2	83·1	106·0	54·0	94·2	66·5	108·2	49·5	*Nil*	...	124
	Murgoo	...	...	...	...	98·3	68·3	83·3	109·0	54·9	...	...	...	...	18	1	18
	Yalgoo	29·924	29·928	30·130	29·608	96·7	65·0	81·4	107·0	49·0	91·9	64·0	107·7	48·6	5	1	49
	Lawlers	29·940	29·935	30·143	29·686	94·0	67·3	80·6	102·0	54·1	89·5	65·2	105·1	46·8	*Nil*	...	338
	Laverton	29·980	29·991	30·273	29·711	90·7	63·8	77·2	100·5	52·2	88·1	62·3	103·2	48·2	*Nil*	...	339
	Menzies	29·989	29·976	30·204	29·760	90·3	62·3	76·3	100·0	48·4	87·3	61·8	105·0	46·0	*Nil*	...	296
	Kanowna	...	...	...	...	87·9	59·6	73·8	99·0	45·5	...	...	...	...	4	1	161
	Kalgoorlie	30·024	30·006	30·286	29·710	88·0	60·4	74·2	99·2	47·0	86·0	59·8	104·0	43·8	25	1	88
	Coolgardie	29·998	29·998	30·245	29·692	87·2	58·8	73·0	100·0	44·9	85·9	58·5	104·2	43·5	4	1	134
	Southern Cross ...	30·000	29·978	30·240	29·720	90·0	58·0	74·0	108·0	39·0	87·5	56·8	105·6	40·0	*Nil*	...	101
	Kellerberrin	...	...	...	...	...	...	...	...	...	...	...	...	...	1	1	65
	Walebing	...	...	...	...	88·4	58·5	73·4	105·0	44·4	90·6	58·7	104·9	45·4	7	1	172
	Northam*	...	...	...	...	89·5	58·5	74·0	105·2	45·5	88·7	58·1	106·6	42·3	7	2	30
	York	30·030	30·010	30·271	29·742	88·5	57·4	73·0	103·5	44·5	86·4	55·2	105·2	41·1	1	1	22
	Guildford	...	...	...	...	87·7	59·7	73·7	107·0	44·3	86·2	56·7	105·8	42·1	26	1	106

The Climate of Western Australia during March, 1906—*continued.*

Locality.	Barometer (corrected and reduced to sea-level). Mean of 9 a.m. and 3 p.m.	Average for previous years.	Highest for Month.	Lowest for Month.	Shade Temperatures. March, 1906. Mean Max.	Mean Min.	Mean of Month.	Highest Max.	Lowest Min.	*Average for previous Years. Mean Max.	Mean Min.	Highest ever recorded.	Lowest ever recorded.	Rainfall. Points (100 to inch) in Month.	Wet Days.	Total Points since Jan. 1.
South-West and South Coast:																
Perth Gardens ...	30·023	30·028	30·229	29·691	85·3	62·8	74·0	103·4	48·0	84·0	60·6	104·0	45·4	63	3	188
Perth Observatory	30·024	30·023	30·331	29·691	83·9	62·0	73·0	104·3	47·5	80·9	60·0	103·7	45·8	37	4	159
Fremantle	30·054	30·025	30·246	29·737	80·4	63·9	72·2	98·8	50·5	77·8	61·6	100·1	48·3	13	2	78
Rottnest	30·050	29·996	30·258	29·744	78·4	63·9	71·2	100·4	50·2	76·9	63·1	95·0	52·2	15	2	48
Mandurah	...	...	...	...	82·8	58·7	70·2	99·3	41·0	80·7	56·2	99·2	38·8	21	3	157
Marradong	...	...	...	...	...	...	...	...	...	...	...	...	...	*Nil*	...	106
Wandering	...	...	...	...	83·3	48·3	65·8	99·5	36·1	...	...	...	...	17	2	67
Narrogin	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
Collie ...	...	...	...	...	81·7	50·9	66·3	100·0	36·5	81·2	48·1	100·8	34·7	55	4	203
Donnybrook*	...	...	...	...	81·1	54·0	67·6	100·3	38·2	81·5	53·1	99·9	35·9	36	2	257
Bunbury	30·045	30·046	30·240	29·730	79·0	58·6	68·8	96·2	42·8	78·4	55·6	96·5	40·0	33	4	184
Busselton	...	...	...	...	78·9	54·9	66·9	94·8	40·1	77·5	51·5	93·8	36·7	33	6	134
Cape Naturaliste	30·058	...	30·240	29·800	74·0	59·0	66·5	91·0	49·0	...	...	...	...	94	5	209
Bridgetown	...	...	...	...	80·4	50·0	65·7	99·0	37·0	80·3	46·2	100·9	31·2	78	5	246
Karridale	30·040	30·060	30·260	29·740	77·0	55·0	66·0	98·0	41·0	74·4	54·2	101·5	40·8	97	7	349
Cape Leeuwin	30·045	30·026	30·280	29·740	73·0	62·0	67·5	94·0	55·0	71·7	60·8	91·0	50·5	104	11	365
Katanning	30·040	30·029	30·270	29·840	82·1	53·8	68·0	102·0	41·0	80·5	51·0	102·8	35·0	14	1	199
Mt. Barker	...	...	...	...	75·3	52·7	64·0	98·4	41·0	...	...	...	...	101	9	309
Albany ...	30·085	30·052	30·330	29·830	73·0	57·4	65·2	95·0	47·2	71·8	54·9	98·4	38·7	130	8	299
Breaksea...	30·060	30·048	30·370	29·730	69·7	59·8	64·8	78·0	51·5	68·5	58·3	93·0	45·0	57	11	283
Esperance	30·083	30·058	30·329	29·801	78·4	58·1	68·2	98·5	44·8	76·7	56·8	104·4	40·6	13	4	177
Balladonia*	30·086	30·070	30·297	29·756	82·2	57·9	70·0	99·5	44·0	81·2	53·1	97·4	38·1	*Nil*	...	112
Eyre ...	30·062	30·060	30·306	29·692	77·4	54·8	66·1	101·8	39·8	77·5	56·6	105·0	38·2	4	1	249
INTERSTATE.																
Perth ...	30·024	30·023	30·231	29·691	83·9	62·0	73·0	104·3	47·5	80·9	60·0	103·7	45·8	37	4	159
Adelaide	30·060	30·068	30·360	29·800	78·1	58·3	68·2	93·7	48·0	81·4	59·2	108·0	44·8	236	...	236
Melbourne	...	29·966	...	...	...	...	...	...	...	74·7	54·6	105·5	37·1	...	...	...
Sydney	30·080	30·054	30·390	29·760	75·0	62·0	68·5	91·0	53·0	75·4	63·1	103·6	48·8	423	...	682

* Averages for three years only.

The Observatory, Perth, April, 1906.

W E. COOKE, Government Astronomer.

RAINFALL for February, 1906 (completed as far as possible), and for March, 1906 (principally from Telegraphic Reports).

Stations.	February. No. of points. 100 = 1in.	February. No. of wet days.	March. No. of points. 100 = 1in.	March. No. of wet days.
East Kimberley:				
Wyndham ...	431	11	285	6
6-Mile	710	8	...	...
Carlton	457	12	...	...
The Stud Station	...	...	...	...
Argyle Downs ...	547	10	...	...
Rosewood Downs	..	...	...	...
Lisadell	..	...	...	...
Turkey Creek ...	498	12	70	7
Ord River ...	...	...	...	...
Alice Downs ...	637	15	...	...
Flora Valley ...	149	5	...	...
Hall's Creek ...	126	9	15	3
Nicholson Plains	...	...	...	...
Ruby Plains ...	...	...	...	..
Denison Downs	...	...	...	...
West Kimberley:				
Mt. Barnett ...	...	...	...	...
Corvendine ...	...	...	...	...
Leopold Downs...	...	...	...	...
Fitzroy Crossing (P.O.)	1247	12	Nil	...
Fitzroy Station ...	1050	12	...	...
Quanbun ...	318	7	...	...
Nookanbah ...	630	11	...	...
Upper Liveringa	510	8	...	...
Mt. Anderson ...	...	...	...	...
Yeeda	...	...	...	...
Derby	460	9	27	1
Pt. Torment ...	465	6	...	...
Obagama ...	363	9	...	...
Beagle Bay ...	931	13	...	...
Roebuck Downs	349	6	...	...
Kimberley Downs	...	...	...	...
Broome	410	7	Nil	...
Thangoo ...	...	...	...	...
La Grange Bay...	308	7	Nil	...
N.W. Coast:				
Wallal	236	8	Nil	...
Pardoo	49	5	...	...
Condon	110	3	Nil	...
DeGrey River ...	...	...	...	...
Port Hedland ...	181	7	113	1
Boodarie ...	62	1	...	...
N.W. Coast—*cont.*				
Balla Balla ...	...	...	...	...
Whim Creek ...	96	3	Nil	...
Mallina	...	...	...	...
Croydon	Nil	...	...	...
Sherlock ...	...	...	...	...
Woodbrooke ...	8	1	...	...
Cooyapooya ...	9	1	...	...
Roebourne ...	38	1	Nil	...
Cossack	95	1	Nil	...
Fortescue ...	48	2	Nil	...
Mardie	Nil	...	...	...
Chinginarra ...	Nil	...	...	...
Yarraloola ...	87	2	...	...
Peedamullah ...	117	2	...	...
Onslow	Nil	...	1	1
Point Cloates ...	...	...	...	...
N.W. Inland:				
Warrawagine ...	400	5	...	...
Eel Creek ...	565	7	...	...
Muccan	674	10	...	...
Ettrick	...	...	...	...
Mulgie	198	2	...	...
Warralong ...	191	5	...	...
Coongon... ...	210	6	..	...
Talga	...	...	...	...
Bamboo Creek ...	124	8	90	1
Moolyella ...	...	...	...	...
Marble Bar ...	267	10	16	1
Warrawoona ...	313	4	Nil	...
Corunna Downs	197	6	...	...
Mt. Edgar ...	240	7	...	...
Nullagine ...	197	6	Nil	...
Middle Creek ...	55	5	...	...
Mosquito Creek	...	...	...	...
Roy Hill... ...	67	4	...	...
Bamboo Springs	Nil	...	...	...
Kerdiadary ...	110	1	...	...
Woodstock ...	147	4	...	...
Yandyarra ...	68	2	...	...
Station Peak ...	87	1	...	...
Mulga Downs ...	64	3	...	...
Mt. Florence ...	19	2	...	...
Tambrey ...	145	4	...	...
Millstream ...	182	4	...	...
Red Hill... ...	291	4	...	...

RAINFALL—*continued.*

Stations.	February. No. of points. 100 = 1in.	February. No. of wet days.	March. No. of points. 100 = 1in.	March. No. of wet days.
N.W. Inland—*cont.*				
Mt. Stewart	...	...	...	...
Peake Station	176	2	...	...
Nanutarra	...	...	...	...
Yanrey	...	...	...	...
Wogoola...	...	...	...	...
Towera	52	3	...	...
Gascoyne:				
Winning Pool	19	2	10	1
Coordalia	...	...	...	...
Wandagee	Nil	...	...	...
Williambury	9	1	...	...
Yanyeareddy	...	...	...	...
Maroonah	...	...	...	...
Ullawarra	...	...	...	...
Mt. Mortimer	85	3	...	...
Edmunds	50	2	...	...
Minnie Creek	Nil	...	...	...
Gifford Creek	...	...	...	...
Bangemall	130	2	...	...
Mt. Augustus	...	...	...	...
Upper Clifton Downs	...	...	...	...
Clifton Downs	...	...	...	...
Dairy Creek	...	...	...	...
Mearerbundie	Nil	...	...	...
Byro	...	...	...	...
Meedo	Nil	...	...	...
Mungarra	...	...	...	...
Bintholya	Nil	...	...	...
Booloogooroo	...	...	...	...
Doorawarrah	Nil	...	...	...
Brick House	Nil	...	...	...
Boolathana	Nil	...	...	...
Carnarvon	Nil	...	Nil	...
Dirk Hartog	...	...	...	...
Shark Bay	Nil	...	Nil	...
Wooramel	Nil	...	Nil	...
Hamelin Pool	Nil	...	Nil	...
Kararang	...	...	...	...
Tamala	...	...	...	...
Yalgoo District:				
Woolgorong	...	...	...	...
New Forest	...	...	...	...
Yuin	...	...	...	...
Pindathuna	39	2	...	...
Yalgoo District—*contd.*				
Tallyrang	...	...	...	...
Mullewa	Nil	...	2	1
Kockatea	Nil	...	...	...
Barnong	Nil	...	...	...
Gullewa ...	Nil	...	Nil	...
Gullewa House	Nil	...	...	...
Gabyon	12	1	...	...
Mellenbye	Nil	...	...	...
Wearagaminda	10	1	...	...
Yalgoo	42	1	5	1
Wagga Wagga	Nil	...	...	...
Muralgarra	Nil	...	...	...
Burnerbinmah	Nil	...	...	...
Nalbara	3	3	...	...
Wydgee	Nil	...	...	...
Field's Find	Nil	...	...	...
Rothesay	...	...	...	...
Ninghan	Nil	...	...	...
Condingnow	...	...	...	...
163-Mile	76	3	...	...
Palaga Rocks	65	3	...	...
126-Mile	104	7	...	...
90-Mile	80	3	...	..
Mt. Jackson	...	...	..	...
Murchison:				
Wale	...	...	...	...
Yallalonga	10	1	...	...
Billabalong	...	...	...	...
Twin Peaks	...	...	...	...
Murgoo	Nil	...	18	1
Mt. Wittenoom	Nil	...	...	...
Meka	38	1	...	...
Wooleane	...	...	..	...
Boolardy	...	...	...	...
Woogorong	Nil	...	...	...
Manfred	Nil	...	...	...
Yarra Yarra	Nil	...	...	...
Milly Milly	20	3	...	...
Berringarra	36	3	...	...
Mileura	47	4	...	...
Mt. Gould	104	1	...	...
Moorarie	60	1	..	...
Wandary	...	...	...	...
Peak Hill	22	2	Nil	...
Mt. Fraser	...	...	...	...
Abbotts	30	3	Nil	...
Belele	...	...	...	...

RAINFALL—*continued.*

Stations.	February. No. of points. 100 = 1in.	February. No. of wet days.	March. No. of points. 100 = 1in.	March. No. of wet days.
MURCHISON—*contd.*				
Meekatharra	...	...	...	...
Star of the East	26	3	Nil	...
Nannine	138	5	Nil	...
Annean	68	4	...	...
Tuckanarra	10	1	...	...
Coodardy	60	2	Nil	...
Cue	73	2	Nil	...
Day Dawn	42	4	2	1
Lake Austin	34	3	Nil	...
Lennonville	73	4	7	2
Mt. Magnet	29	3	Nil	...
Youeragabbie	Nil	...	...	...
Murrum	...	...	...	...
Challa	75	5	...	...
Nunngarra	81	2	...	...
EAST MURCHISON:				
Gum Creek	19	1	...	...
Dural	...	...	...	...
Wiluna	187	4	17	1
Mt. Sir Samuel	263	5	Nil	...
Leinster G.M.	...	...	...	...
Lawlers	110	7	Nil	...
Lake Darlôt	62	5	...	...
Darda	98	5	...	...
Salt Soak	75	5	...	...
Duketon	7	1	...	...
NORTH COOLGARDIE GOLDFIELDS:				
Burtville	...	...	...	...
Laverton	152	5	Nil	...
Mt. Morgans	158	4	Nil	...
Murrin Murrin	201	6	10	1
Mt. Malcolm	77	6	Nil	...
Mt. Leonora	81	5	40	2
Tampa	...	...	...	...
Kookynie	105	7	Nil	...
Niagara	197	7	Nil	...
Yerilla	249	5	...	...
Yundamindera	239	4	14	2
Mt. Celia	...	...	...	...
Edjudina	160	6	...	...
Quandinnie	120	3	...	...
Menzies	296	7	Nil	...
Mulline	213	7	Nil	...
Mulwarrie	96	6	15	1
Goongarrie	520	7	16	1

Stations.	February. No. of points. 100 = 1in.	February. No. of wet days.	March. No. of points. 100 = 1in.	March. No. of wet days.
COOLGARDIE GOLDFIELDS:				
Waverley	170	4	...	...
Bardoc	92	4	15	1
Broad Arrow	253	5	4	1
Kanowna	117	4	4	1
Kurnalpi	180	7	3	1
Bulong	87	8	Nil	...
Kalgoorlie	63	5	25	1
Coolgardie	87	7	4	1
Burbanks	89	8	Nil	...
Bulla Bulling	120	9	Nil	...
Woolubar	75	6	...	...
Waterdale	137	8	...	...
Widgiemooltha	138	7	Nil	...
50-Mile	193	7	...	...
Norseman	182	9	Nil	...
Lake View	145	5	...	...
Frazer Range	62	2	...	...
Southern Hills	145	2	...	...
YILGARN GOLDFIELDS:				
129-Mile	61	4	...	...
Emu Rocks	28	5	...	...
56-Mile	126	3	...	...
Glenelg Rocks	53	6	...	...
Burracoppin	54	3	Nil	...
Bodallin	123	3	...	...
Parker's Road	46	3	...	...
Southern Cross	98	9	Nil	...
Parker's Range	224	8	2	2
Yellowdine	143	8	Nil	...
Karalee	160	5	Nil	...
Koorarawalyee	288	10	Nil	...
Boorabbin	240	6	Nil	...
Boondi	203	8	Nil	...
SOUTH-WEST (NORTHERN DIVISION):				
Murchison House	8	1	...	...
Mt. View	Nil	...	...	...
Mumby	6	1	5	1
Northampton	7	1	Nil	...
Chapman Experimental Farm	Nil	...	...	...
Narra Tarra	Nil	...	...	...

RAINFALL—*continued.*

Stations.	February.		March.	
	No. of points. 100 = 1in.	No. of wet days.	No. of points. 100 = 1in.	No. of wet days.
South-West (Northern Division)—*contd.*				
Oakabella ...	3	1	...	...
White Peak ...	6	1	...	...
Geraldton ...	Nil	...	Nil	...
Hinton Farm ...	Nil	...	Nil	...
Tibradden ...	20	1	10	1
Myaree	2	1	...	...
Sand Springs ...	...	...	...	...
Nangetty ...	Nil	...	...	...
Greenough ...	Nil	...	3	1
Bokara	3	1	3	1
Dongara ...	Nil	...	Nil	...
Strawberry ...	Nil	...	...	...
Yaragadee ...	...	...	...	...
Urella	Nil	...	7	1
Opawa	99	1	...	...
Mingenew ...	4	1	Nil	...
Yandenooka ...	190	1	...	...
Carnamah ...	4	1	6	1
Watheroo ...	Nil	...	5	1
Nergaminon ...	...	...	...	...
Dandaragan ...	16	2	10	1
Yatheroo ...	Nil	...	...	..
Moora	Nil	...	9	1
Walebing ...	115	5	7	1
Round Hill ...	Nil	...	...	...
New Norcia ...	20	3	12	1
Wongon Hills ...	2	1	...	...
Wannamel ...	Nil	...	25	1
Gingin	5	2	25	1
South-West (Metropolitan):				
Wanneroo ...	Nil	...	...	...
Belvoir	14	2	...	...
Wandu	18	6	21	4
Mundaring ...	28	2	19	1
Canning Waterworks	17	2	...	...
Kalbyamba ...	23	4	31	2
Guildford ...	7	2	26	1
Perth Gardens ...	44	5	63	3
Perth Observatory	42	5	37	4
Highgate Hill ...	26	5	...	...
Subiaco	30	3	37	1
Claremont ...	...	...	...	...
Fremantle ...	16	4	13	2

Stations.	February.		March.	
	No. of points. 100 = 1in.	No. of wet days.	No. of points. 100 = 1in.	No. of wet days.
South-West (Metropolitan)—*cont.*				
Rottnest	22	3	15	3
Rockingham ...	20	1	47	3
Jandakot ...	32	3	48	2
Armadale ...	...	...	...	..
Mundijong ...	38	5	23	3
Jarrahdale ...	44	5	47	4
Jarrahdale (Norie)	36	4	36	4
Serpentine ...	27	5	28	4
Extreme South-West:				
Mandurah ...	74	3	21	3
Pinjarra (Blythewood)	108	3	39	4
Pinjarra	75	3	27	5
Upper Murray ...	93	5	36	4
Yarloop	100	2	29	3
Harvey	39	2	41	5
Brunswick ...	74	3	...	...
Collie	42	2	55	4
Glen Mervyn ...	30	3	...	...
Donnybrook ...	53	3	36	2
Boyanup ...	81	3	29	4
Bunbury ...	50	3	33	4
Busselton ...	70	3	33	6
Quindalup ...	107	3	...	...
Cape Naturaliste	57	3	94	5
Glen Lossie ...	113	7	...	...
Karridale ...	107	6	104	11
Cape Leeuwin ...	167	9	97	7
Lower Blackwood	12	1	...	...
Ferndale ...	...	...	...	...
Greenbushes ...	57	2	53	2
The Peninsula ...	73	3	...	...
Bridgetown ...	58	2	78	5
Hilton	...	...	...	...
Greenfields ...	20	2	...	...
Cundinup ...	72	3	18	2
Wilgarrup ...	60	3	...	...
Balbarrup ...	87	1	...	...
Bidellia ...	...	...	...	...
The Warren ...	...	...	...	...
Westbourne ...	224	5	...	...
Deeside	...	...	...	...
Riverside ...	121	3	...	...
Mordalup ...	47	2	...	...
Lake Muir ...	48	5	...	...

RAINFALL—*continued.*

Stations.	February.		March.	
	No. of points. 100 = 1in.	No. of wet days.	No. of points. 100 = 1in.	No. of wet days.
Eastern Agricultural Districts:				
Emungin	10	5	...	...
Dowerin	Nil	...	...	...
Warramuggin	...	...	...	...
Monglin	...	...	...	...
Hatherley	...	...	...	...
Momberkine	30	1	6	1
Eumalga	Nil	...	10	1
Newcastle	3	1	12	1
Craiglands	Nil	...	32	2
Eadine	4	1	3	1
Northam	Nil	...	7	2
Grass Valley	Nil	...	Nil	...
Cobham	7	1	13	2
York	Nil	...	1	1
Yenelin	...	...	...	...
Meckering	26	2	6	1
Cunderdin	42	1	...	...
Doongin	Nil	...	...	..
Whitehaven	...	...	...	...
Mt. Caroline	27	2	...	...
Cutenning	61	2	7	2
Kellerberrin	28	2	1	1
Cardonia	45	2	...	...
Baandee	18	1	Nil	...
Nangeenan	99	5	Nil	...
Merredin	19	3	...	...
Codg-Codgen	55	5	...	...
Noongarin	...	...	...	...
Mangowine	50	3	Nil	...
Yarragin	95	3	...	...
Wattoning	...	...	...	...
Great Southern Railway Line:				
Dalebridge	Nil	...	10	1
Beverley	Nil	...	5	1
Brookton	...	...	...	...
Sunning Hill	7	2	6	2
Pingelly	2	1	8	1
Yornaning	12	2	11	1
Narrogin	17	2	15	3
Narrogin Experimental Farm	23	1	...	...
Wagin	75	1	75	1
Katanning	168	3	14	1
Sunnyside	207	4	...	...
Broomehill	249	2	26	2

Stations.	February.		March.	
	No. of points. 100 = 1in.	No. of wet days.	No. of points. 100 = 1in.	No of wet days.
Great Southern Railway Line—*contd.*				
Woodyarrup	158	3	...	...
Pallinup	...	...	32	2
Tambellup	291	8	...	...
Toolbrunup	112	1	43	3
Cranbrook	...	...	...	...
Stirling View	215	3	...	...
Kendenup	163	2	67	4
Woogenellup	184	3	...	...
Wattle Hill	129	10	149	12
St. Werburgh's	157	4	...	...
Mt. Barker	156	5	101	9
West of Great Southern Railway Line:				
Talbot House	Nil	...	7	1
Jelcobine	9	2	...	...
Bannister	...	...	...	...
Wandering	14	2	17	2
Glen Ern	5	2	...	...
Marradong	29	3	Nil	...
Wonnaminta	14	3	...	...
Williams	30	3	6	1
Rifle Downs	6	2	...	...
Darkan	Nil	...	...	...
Arthur River	12	2	4	1
Glenorchy	36	2	...	...
Kojonup	139	4	21	3
Blackwattle	118	2	...	...
Warriup	153	4	42	3
Forest Hill	...	...	...	...
East of Great Southern Railway Line:				
Sunset Hills	Nil	...	...	...
Oakdale	8	1	...	...
Barrington	7	1	3	1
Bally Bally	4	1	...	...
Stock Hill	Nil	...	Nil	...
Qualin	3	1	12	1
Woodgreen	6	2	3	1
Gillimanning	10	2	...	...

RAINFALL—*continued.*

Stations.	February. No. of Points. 100 = 1in.	February. No. of wet days.	March. No. of Points. 100 = 1in.	March. No. of wet days.
East of Great Southern Railway Line—*cont.*				
Wickepin ...	22	3	...	...
Crooked Pool ...	3	1	19	2
Bunking ...	Nil	...	...	...
Bullock Hills ...	...	...	...	...
Dyliabing ...	81	3	...	...
Glencove ...	81	2	6	2
Cherillalup ...	108	2	...	...
Mianelup ...	230	3	31	3
Woolganup ...	308	3	...	...
Chillinup ...	...	...	...	...
Jarramongup ...	...	...	...	...
South Coast:				
Wilson's Inlet ...	63	3	...	...
Grasmere ...	67	5	146	6
King River ...	139	1	85	5
Albany	110	6	130	8
Point King ...	130	3	107	5
Breaksea ...	172	8	57	11
Cape Riche ...	35	3	...	...
South Coast—*cont.*				
Peppermint Grove	339	5	...	...
Bremer Bay ...	223	4	105	4
Coconarup ...	...	...	...	...
Ravensthorpe ...	11	...	49	4
Cowjanup ...	34	...	...	...
Hopetoun ...	Nil	...	112	2
Fanny's Cove ...	21	...	...	...
Park Farm ...	106	4	...	...
Grass Patch ...	68	2	...	...
Swan Lagoon ...	79	5	...	...
30-Mile	67	5	...	...
Gibson's Soak ...	81	7	...	...
Myrup	57	6	...	...
Esperance ...	72	4	13	4
Boyatup	148	6	...	...
Lynburn ...	...	...	...	...
Middle Island ...	...	...	...	...
Point Malcolm ...	239	10	...	...
Israelite Bay ...	87	9	44	5
Balbinia	143	6	...	...
Balladonia ...	90	4	Nil	...
Eyre	10	2	4	1
Mundrabella ...	...	...	...	...
Eucla	6	4	3	1

The Observatory, Perth,
7th April, 1906.

W. E. COOKE,
Government Astronomer.

By Authority: A. Curtis, Acting Government Printer, Perth.

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EDITOR'S NOTES.

FODDER GRASSES.—Amongst the many fodder grasses now being tried in this State it is found that both *Chloris virgata* (Rhodes Grass) and *Panicum spectabile* (African Wonder Grass) do very well.

MANGELS FOR FEED.—When mangels are grown for feed they should always be stored for a few months before giving to cattle, otherwise it causes scour. After mellowing by keeping, mangels form a most valuable food, the best results being obtained from roots that have been stored from seven to eight months.

A NEW GRASS.—What is considered a new and valuable fodder grass is the *Phalaris commustata*. In New South Wales it grows to six feet high, and is stated to be better than *Paspalum*. It also grows well in Gippsland. Cattle eat it greedily, and it has succulent and fattening properties. It grows well all through the year, and is a great drought resister.

LINSEED CULTIVATION.—The demand for linseed is continually on the increase; although the supply has been practically doubled during the last five years the ratio to the requirements remain about the same. During the last five years 2,080,000qrs. were imported into England, valued at £20,974,000. The seed is used for the extraction of oil, and the residue is made into linseed cake for cattle-feeding. The United States returns show that an equal quantity was used there. Germany and Russia are also great producers.

Nitrogen from the Air.—A factory on a very extensive scale has been established in Sweden for the purpose of the fixation of nitrogen from the air, and which takes the form of nitrate of lime. The product resembles salt. It is easily dissolved in water, and a method is being introduced of transforming it into a basic salt, which keeps dry, and which can be distributed in a granular form by means of agricultural sowing machines. Germany is taking the product as fast as it is made, and it is said to be a most valuable manure, and especially suitable for loam and sandy soils.

Chemical Fertilisers.—In hardly any country are chemical fertilisers more valued than in Germany, where 79,000,000 acres are cultivated, on which £12,000,000 worth of fertilisers are annually used, or a little over three shillings' worth to the acre, the effect of which is to increase the value of the crops from seven to ten times the amount spent on it. It also enables the Empire to produce sufficient to feed her population of 60,000,000 people. The secret of such success is that fertilising in Germany is conducted on scientific principles and not by rule of thumb, as is too often the case with farmers.

The Brumbie.—The "Brumbie," or feral bush pony, according to popular tradition in Western Australia, is descended from a few horses which were cast ashore from a vessel wrecked when rounding Cape Leeuwin. These rough-looking animals stand, on the average, about 13 hands, though occasionally examples as high as 15 hands are seen. Their chief characteristics are their wonderful powers of endurance; the astonishing length of time they can travel without water or food, and the agility with which they can negotiate the rockiest and most dangerous country. Brumbies are frequently used by miners, prospectors, and bushmen, and as these men do not, as a rule, pay much attention to the appearance of their animals, the brumbie is usually not prepossessing to look at. In more careful hands the use of the currycomb and brush and good feed makes a wonderful difference in their appearance.

Where Codlin Moths are Bred.—As a result of inquiries made by the Commissioner of Horticulture of California on the ravages of the Codlin Moth and its suppression, it has been proved that while it was very difficult indeed to find a grub in the orchard, thousands of the pest were discovered in the packing houses. It is found very difficult to try to combat this pest with parasites when the grubs are allowed to breed in a place inaccessible to the parasite. The fruit is picked before the grub emerges, and is taken into the packing house, where, in a sense, they are protected from any danger, and allowed to breed out at their own sweet will. It is recommended that fruit should either be stored in open sheds easily accessible to the parasites, or else in a properly constructed building where the contents may be fumigated from time to time, and thus destroy the pest.

Why Seeds Fail.—There are right and wrong ways of sowing seeds, The favourite wrong way is to bury them so deep that they die of suffocation. The general rule to observe in sowing seeds is to cover them with soil to the

depth of their diameter, which is equivalent to saying that most seeds must merely be sown on the surface of the ground, and lightly pressed in. A frequent cause of seeds failing to come up is that the ground is too rough. A seed-bed, to be satisfactory, must have the surface soil pulverised as finely as possible. Seeds, too, are almost always sown too thickly. This is not only a wasteful habit, but gives a great deal of extra trouble later on when the young plants require thinning. It is a good plan to mix very small seeds with sand and to sow the mixture out of a pepper-box.

CULTIVATION.—In all new countries wealth is first sought in scratching over the surface—that does for a time, but it won't last. It is expected that men will make use of observation and reason in discovering what is necessary to be done. If surface scratching would do for all time then observation and thought would stop there. Crops, like virtue, must be intelligently cultivated. The best soil is very soon exhausted of that which contributes to plant life and growth. Fertility is more than skin deep. Soil, like man, needs to be stirred. Fertility goes far below a few inches from the top; the object is to bring it up when the surface has been exhausted. Strength of fertility is deep. Stirring the ground releases the fertilising agents and makes them available to be taken up by the roots of the plants. There are differences in regard to plants so far as disturbance of the soil is concerned; the facts must be found out through experiment.

RED SCALE PARASITE.—In November last Mr. Compère, the Government Entomologist, on his return from China brought with him a small colony of parasites of the red scale. On opening up the package in which these little insects had made their journey, it was found that only 15 had survived the trip. These were liberated on a small orange tree infested with red scale, which had been enclosed in a breeding-out box in the Entomological Room of the Department, for the purpose of supervision and the prevention of releasing any secondaries should they happen to be present. Within a few weeks a number of the true parasites were found to have bred out. These were liberated in local orchards, where they at once started to attack the red scale. The result, so far as can at present be seen, is that there are thousands of these little flies to be seen in and about the vicinity of their first liberation. Orchardists are warned not to spray for red scale, but to give the parasite an opportunity to establish itself. A visit to the Department, where specimens can be seen, will assist the grower to identify the parasite, and thus be able to protect it.

IMPACTION IN CATTLE.—Complaints have been received by the Department of several cases of impaction in cattle. The matter being referred to the Government Veterinary Surgeon, Mr. Weir stated that in the early stages of the disease, when the animal's strength has not been seriously impaired, a full cathartic may be given of the following:—

Epsom Salts	1½ lb.
Ginger	2 ounces.
Calomel	1 dram.
Treacle	1 lb.
Common Salt	½ lb.

Dissolve in hot water and administer. On the following day, and until the medicine has operated, stimulants are to be given in the form of whisky (two wineglassfuls) made into toddy, every four hours. Should the animal be in a weakened condition, one pint of linseed oil combined with half-ounce each of ginger and gentian should be supplied. On the following day give calomel (two drams) combined with liquor ammon. (two drams). Half of these two doses may be repeated every alternate day until signs of recovery are noticeable. The animal is to be fed on damped bran and chaff to which a little salt and treacle has been added. Friction should be applied to the body, and the animal's strength maintained as much as possible.

SUCCESSFUL FRUIT EXPORT.—Gratifying news has been received by the Premier of the success of the shipment of apples recently made to Bremen through Messrs. H. G. Barker & Co., of Surrey Chambers. The information was contained in the following cable message from the Agent General in London:—"Apples *ex* 'Friedrich der Grosse' have been sold at Bremen, realising first-class prices, averaging £1 1s. 6d. per case, after keen competition. The broker states he can sell 10,000 to 20,000 cases of such apples." The importance of this news to the orchardists of the State cannot be over-estimated. It will be remembered that the shipment to which the cablegram refers consisted of 60 cases of an average of 40lb. per case. The shipment was made on an entirely commercial basis, and it was the first attempt to introduce the West Australian apple to the Continental market. The fruit came from many different districts of the State, and none of the apples shipped were less than 2½in. in diameter. Mr. Barker, has supplied information relating to the cost of sending fruit to Bremen. He had ascertained from the data in his possession that the total charges—including the cost of the cases, the railage on the empty cases to the orchard, and on the full cases to the port, the wharfage, cartage, branding, marine insurance, sea freight, etc.—was 4s. 10d. per case as from the Darling Range district, 5s. 1d. as from Donnybrook, 5s. 5d. from Cranbrook, and 5s. 6d. from Mt. Barker. This, Mr. Barker pointed out, shows that Albany is the natural port for the Great Southern district south of Wagin. It also demonstrates what a great margin of profit remains after payment of all possible charges. It should be added that the "Friedrich der Grosse" shipment was cooled for the consignors by cold storage before it was placed on board, which no doubt contributed to the excellent condition in which it was landed in Europe.

USE OF FERTILISERS.—Fertilisers are fertilisers only when they contain one or more of the essential constituents of plant growth, that is nitrogen, potash, phosphoric acid in such material as nitrate of soda, sulphate of ammonia, acid phosphate, ground bone, muriate of potash, and when their application to the soil will contribute quite as much or more to the growth of crops than the constituents already there. The chief cause for unsatisfactory results from the application of fertilisers to soils deficient in available plant food is that the person using them does not understand the character of the materials he is handling or the characteristics of growth and specific needs of the plant whose growth he intends to encourage. While the value of a commercial fertiliser is determined almost exclusively by the amount and form of the nitrogen, potash, and phosphoric acid which it contains,

it does not follow that all soils or crops will respond equally to applications of fertilisers containing these elements, because the needs of soils and the requirements of crops vary. Soils differ in respect to their need for specific elements owing either to their method of formation or to their management and cropping. A sandy soil is usually deficient in all the essential elements of plant food, while a clayey soil usually contains the mineral elements in abundance, particularly potash. On the other hand, a soil rich in vegetable matter, is frequently deficient in mineral matter, while a limestone soil is likely to contain considerable proportions of phosphoric acid. Another point of importance, the understanding of which is necessary in the adoption of an economical system of fertilisers, is that crops differ in respect to the relations that exist between their fertility content and their selling price. In this respect they may be divided into two classes, those which produce a relatively low commercial value and which contain and carry away when sold a very considerable amount of fertilising constituents, as the cereal grains for example, and those which have a high commercial or market value and which carry away a minimum amount of fertilising constituents—like vegetables and fruits.

CASSAVA.—The plant commonly called cassava has many species, some of which are of great value. The most important species is *Manihat utilissima*, generally known as "manioc" in the tropical countries where grown. This root in its natural state is poisonous, but by treatment the poison disappears and the root is one of the most important food plants of tropical South America. It is this cassava which yields the tapioca of commerce. Another variety has within a few years been introduced into Florida, where it seems to have become of some economic importance. This is said not to have any poisonous qualities. The roots are not nearly so large as those of the tropical varieties, which are very thick and fleshy and sometimes three feet long. It has, we believe, been grown by several Californians; but the best description of it which we have seen is by George P. Hall, of San Diego, and is as follows:—"We secured from the Lake City Agricultural Experimental Station in Florida a box of cassava cuttings and planted them, and have eaten some of the tubers that have grown from the plants, and unhesitatingly pronounce them most excellent and palatable food. The tubers we have raised are not so large as those described in the Florida catalogues, but are the size of ordinary-sized sweet potatoes, and look something like them, only a darker brown. The thin skin is easily scraped off, just as it is from new potatoes, and removes just as easily. We boiled the tubers and then fried them just as you would Irish or sweet potatoes, and our judgment is that they are a far better substitute for Irish potatoes than sweet potatoes. They are very dry and mealy; nothing salvy about them, and they can be used in many ways that potatoes cannot—by grafting the roots and making batter cakes, fritters, and especially puddings. Many uses can be made of the cassava that neither the sweet nor the Irish potato can be put to. It is an excellent fattening food, containing a large proportion of starch; and a fine quality of starch is obtained by soaking the grated root, which is much like cocoa-nut in appearance when grated. In Florida it is used for fattening beef and swine, and is considered the food *par excellence* for that purpose. It will grow best in deep, loamy soil, just as any tuberous rooted plant will. It can be grown where there is from seven to eight months without frost. It is very sensitive to cold, and will match the tomato in this respect." It

is raised from the cuttings made each season of the stalks that grow above ground. These are cut up into lengths of about four inches, and, after deep ploughing, you plant these pieces about as you would corn as to distance apart, and then cultivate just about the same; you cannot go deep, as you would disturb the growing tubers. It requires a long season such as it can get in any of our warm valleys, and is not over-avaricious about water; does not require as much as Irish potatoes, but soil must not dry out. We believe it can be raised where potatoes can be raised.

SCIENTIFIC DAIRYING.—An article dealing with the great strides made in the dairying industry in the United States, and the advantages that have been derived from a scientific knowledge of the subject, recently appeared in the San Francisco *Weekly Chronicle*, from which we take the following:—"It would be interesting, if it were possible, to trace the progress of agricultural ideas and knowledge from the time when they are laughed at by the 'practical' farmers as the queer and probably pernicious notions of 'theorists' down through the days of tolerance, as things which the 'scientific fellers' will talk about, and therefore let them, if they must do it; their acceptance as truth by the more progressive and intelligent; their gradual recognition by the masses in the vague way in which they recognise the attraction of gravity, until finally they become embodied in the traditions of the industry and passed down from father to son as matters known from time immemorial. This process, by the way, is more rapid than many realise. It is scarcely 10 years since the writer was arguing in these pages over the usefulness of silage to the dairyman, and expounding, as well as he could, the theory and practice of producing it. It is less than 10 years since the functions, good and evil, of bacteria in milk and milk products began to be talked about in the agricultural Press, together with the methods of encouraging those whose operations are useful and suppressing those which are undesirable. At that time there was virtually no demand among the creameries of the State for trained butter-makers, and the Babcock test was hardly known in this State. The notion that University professors could 'larn anything' to 'practical' dairymen was derided, and it was only, as the writer can personally testify, by the most vigorous touting that a corporal's guard of them could be rounded up to attend a farmers' institute. When we look back over what has been accomplished during a single decade we shall find abundant inspiration to effort for still further improvement. Of course, there are some dairymen who have not learned and never will learn. We are sorry for them. They will leave very small estates for their children to quarrel over. It is the wide-awake, progressive dairyman, who, carefully keeping his ventures within his means, but doing in the very best manner whatever he undertakes at all, will win out in the end. As an exchange puts it, 'dairy farming offers a great opportunity for growth.' The farmer and all his family can just keep on learning the business and never know too much. There is some talk about the dairy expert, the expert judge of cattle and of butter, etc., but don't get alarmed about them. The 'expert' of to-day is a back number to-morrow. In fact, some of the so-called experts are not able to produce the goods right along. A man makes butter that scores the highest in some great contest. He is lauded to the skies. He is called an expert, and, for fear he will not be able to score well again, he quits. He lives on one great record and drops out of the race. How few are the men who keep winning high butter scores in the great contests!"

OUR ILLUSTRATIONS.

In this issue we reproduce four interesting photographs, taken by Mr. P. G. Wicken, the Field Officer of the Department, while attending the late A.N.A. Exhibition in Melbourne:--

Figure 1.—shows the central part of the main building at Dookie Agricultural College in Victoria. Dookie College was established in 1886, and is the pioneer of our Australian establishments of this kind. The first principal was Mr. J. L. Thompson. The institution is now presided over by Mr. H. Pye. Accommodation is provided for 71 students. This number is shortly to be increased, and facilities are provided for imparting to them a good general agricultural education. The institution is under the control of the Council of Agriculture. The area of the farm is 4,800 acres, and all branches of farm work are carried out. Dairying, wine-making, poultry and pig-raising, orchard work, fruit-drying, and the extraction of olive oil, are all included in the curriculum of the College.

Figure 2.—is a louvred tower outside the dairy building at the Dookie Agricultural College, and is a somewhat novel way of cooling water for dairy purposes. The tower consists of louvre work on all sides from top to bottom. The bottom of the tower consists of a concrete tank, a two-inch pipe runs up the tower to the top, the centre of the tower from the pipe at the top to the concrete tank at the foot being filled with a mass of wire-netting so as to break the fall of the water. The water is pumped to the top of the tower, and falls from there through the wire-netting to the tank at the bottom, while the wind blowing through the tower cools the water very considerably, and enables it to be used for dairy purposes. The height of the tower is about 30 feet. Dookie is situated in one of the warmest parts of Victoria, but, in spite of this, about half a ton of butter is made for sale besides supplying the demands of the college itself.

Figure 3.—is a general view of the main hall of the Exhibition Building in Melbourne during the recent exhibition held under the auspices of the Chamber of Manufacturers at which this State was represented. The State Courts were all situated adjoining each other at the far end of the building next to the stage.

Figure 4.—is a front view of the West Australian Court, showing some of the carved jarrah furniture which was exhibited, as well as other timber exhibits, and views of the S.W. Caves and other places of interest. The posts, and all round the top of the Court, are covered with ropes and bunches of red and white everlasting flowers, which were preserved for this purpose, and had an attractive and artistic appearance. The space occupied by the Court was 45ft. by 16ft., but owing to the other sides of the Court requiring artificial light, the photographs were not suitable for reproducing.

HAMEL EXPERIMENTAL FARM.

By G. F. Berthoud.

POTATO TESTS.

The following report has been received from Mr. G. F. Berthoud, manager of the Experimental Farm, Hamel, on the cultivation tests of potato sowing, which commenced in the first week in November, on light soil of medium quality and fairly moist. The sets consisted of whole tubers planted 5 inches deep, 24 inches apart, in rows 2 feet 6 inches apart. Fertilisers, at the rate of 8cwt. to the acre, was well worked into the soil just before planting. The varieties, which were dug early in March and with the respective results, were as follows:—

Northern Star.—This potato, which created such a stir in England a year or two ago and brought almost fabulous amounts for a single tuber, started off with a good growth, and at an early stage reached the height of 30 inches. The actual results, however, were rather disappointing; the tubers were white, round, mostly badly shaped and very rooty, a large proportion of them being quite unfit for market, being a great deal too small. It is a poor keeper, and, from a grower's point of view, not desirable. The yield was at the rate of 9 tons to the acre.

The Factor.—The growth of this very prolific potato was very healthy and vigorous, reaching a height of 3 feet. The tubers were white and oblong, nearly all of fair marketable size, and from some of the plants as many as 30 tubers were taken. The flesh was firm and sound. This potato is certainly one of the best sorts to cultivate. The yield was at the rate of 25 tons to the acre.

The Freeman.—Growth healthy; foliage smooth and wide, 30 inches high; tubers white, kidney shaped, medium size, and even; flesh firm and sound. Yield, at the rate of 8½ tons per acre.

Edward VII.—This is rather a stunted plant, not exceeding more than two feet in height, but very healthy. The tubers are oblong, with a yellow skin blotched with bright pink. Its appearance is handsome, but in size rather small; the flesh, however, is firm and sound. The crop yielded 8½ tons to the acre.

Evergood.—The growth of this potato was healthy and vigorous, the average height of the plants being 30 inches. The tubers were white, round, and numerous, of a fair marketable size; flesh fair; the keeping qualities, however, are somewhat doubtful. The yield averaged 11 tons to the acre.

The Sutton.—A dwarf variety, of healthy habits, not exceeding 18 inches. The tubers are round and a pale pink colour, but rather small; the flesh is sound and good. Yield small, averaging 6½ tons to the acre.

Up-to-Date.—This is another recently introduced potato, but somehow in this State it certainly does not do all it is alleged to do in England. The growth is vigorous, having a dark green foliage reaching a height of

30 inches. The tubers are white, kidney-shape, and, like the "Northern Star," a very large number of the tubers are small. It is a very poor keeper, and not a very desirable sort to cultivate. The yield averaged 10 tons to the acre.

Pink Blossom.—Growth strong and upright, having a pink flower. A distinct variety, tubers being white, oblong, large, and good. Flesh, firm and sound. Average yield, 10½ tons to the acre, while on another plot it gave a yield of 16 tons per acre.

Queen of the Veldt.—The growth of this plant is both robust and fine, strong stalk and upright habit. Tubers are large, oblong, and well-formed, smooth purple skin, and of fair market size. This is a late variety and requires a good strong soil. Its keeping qualities are very doubtful, and the yield only averaged 5¼ tons per acre. On another plot, however, it yielded 13 tons per acre.

Dalmeny Radium.—Fair growth, two feet high. Flowering very freely, white blossoms. Tubers white, pipple-shaped and rather rough, sound and free from disease. Yield good, averaging 7¾ tons per acre. This potato grown on another plot gave much better results, the yield being at the rate of 19 tons per acre.

Vermont Gold Coin.—Weak growth, two feet high. Tubers white, oblong, fairly large with a rough skin; very few small ones. Good main-crop potato. Yield 4 tons to the acre. This potato grown on another plot gave strong and healthy plants and yielded 18 tons per acre.

Noroton Beauty.—This plant has a very quick and healthy growth, with a wide and smooth foliage, lilac blossom, rather stunted growth about 15 inches in height. Tubers of a pale pink colour, shape round, with bright eyes; nice uniform size, sound and free from disease. A very promising new and early kind. This potato should be tried by all growers who are desirous of a change. The yield was at the rate of 3 tons per acre. In another plot grown at the same time the yield averaged 11 tons per acre.

Eldorado.—Growth weak, foliage of a very sickly appearance, with an average height of plant 12 inches. Tubers white, of oblong shape, but all very small. These potatoes were almost a failure, but this may have been caused by the soil conditions being unsuitable; a stiffer soil should give better results. Yield, 1 ton per acre. This potato grown in another plot did no better. It is not a desirable potato to grow.

Duchess of Norfolk.—The growth of this was of a free and upright nature, with dark green foliage. Tubers coloured brown; nice even size; a fair second early kind. Yield, 5¼ tons per acre. On another plot the same potato gave a yield of 16 tons per acre.

Seedling 115.—Even and healthy growth; height, 30 inches. Tubers round shape, white skinned, with eyes slightly shaded with pink; nice even size throughout; a good sound potato, of late variety. Yield, 7 tons per acre.

Seedling No. 36.—Free and tall growth. Tubers round, pink-coloured skin; eyes rather deeply set; medium size; fairly sound; late variety. Yield, 8¼ tons per acre.

Seedling No. 29.—Fair growth, reaching to 24 inches; stalks somewhat of a spreading habit. Tubers kidney-shaped, of a pale pink colour, rather small, but very sound. Yield, 6 tons per acre.

Money Maker.—This plant, although of very slow growth, was fairly healthy. Tubers of an oblong shape, with a pure white skin, medium size. Yield light, 3½ tons per acre. This when tried on a second plot did much better, giving a yield of 9 tons per acre.

Dalmeny Red.—Slow growth with sickly foliage, green stalks, and prone to making a second growth. Tubers very numerous, but rooty and badly shaped, of a pale pink colour. Not a desirable variety to cultivate. Yield, 5 tons per acre.

Pink Eye.—The sample received of this potato was a poor one. The growth, which was of an upright habit, was slow and weakly, very few tubers to the plant, which were only of a medium size. Yield, very moderate.

Snowball.—This was a fair grower, but was not fully matured at time of digging; the tubers were fine and large. Although a late variety, it is a good table sort. Yield, 10 tons per acre.

Red River Triumph.—This was some American seed, and was not planted until the first week in January, and dug at the end of March. The tubers were round, large, and very even. It should be a good early variety, giving a yield of 19 tons per acre.

Early Rose.—American seed, sown 3rd January, matured 3rd April. This is also a fair early potato, well known, oblong shape, pale pink colour, of fair size. Yield, eight tons per acre.

Clinton.—This was also American seed, planted and matured the same time as the Early Rose. A strong grower, tubers white, round, of even size; a good second early variety. Yield, nine tons per acre.

The following five seedlings were planted on January 5th and dug on the 5th May. A complete manure was used at the rate of 6cwt. to the acre. The soil was good, moist lowlands.

Seedling No. 150.—The growth of these plants was moderate; tubers of neat shape and size; tubers bright purple, set close to stalk; a good second early. Yield, 6½ tons per acre.

Seedling No. 212.—Strong well-growing variety, level and even, with thick stalks; tubers large, flat and round, of a deep reddish purple colour, set close to stalk. Yield, 9½ tons per acre.

Seedling No. 194.—This variety, which showed a strong and even growth, was hardly matured when dug. The tubers were very numerous, of an oblong or pebble shape, light purple in colour, set close to stalk. Yield, 9½ tons per acre.

Seedling No. 147.—These were also dug too early. The tubers were large and rough-shaped, set rather far from the stalks, purple colour. Yield, 7 tons per acre.

Seedling No. 190.—The growth of these plants was very healthy, vigorous and fine, flowering early; tubers of neat shape and even size, smooth skin of a pinkish tint. Yield, 10 tons per acre.

NOTE.—The complete manure used in all these tests consisted of four parts of superphosphates, one part sulphate of ammonia, and one part of sulphate of potash.

WINE DISEASES.

By A. Despeissis.

Detection of Diseases of Wine.

(Continued from page 238, March issue.)

Wine being a highly complex liquid, in the body of which chemical changes, often stimulated by living organisms, are ever taking place, it is evident that both chemical analysis and microscopical investigation will reveal, to some extent, whether it is in a diseased or in a healthy condition; but no investigation, however carefully conducted, in the chemical laboratory or under the microscope, will reveal to what extent, if at all, any alteration has taken place.

The first indications regarding the soundness of any given sample of wine are given by the organs of sight, smell, and taste, and their systematic application to finding the quality of wines or to detecting the defects and diseases of wine constitute:

Wine Tasting.

Anyone almost is competent, after tasting, to pass an opinion as regards the pleasantness or unpleasantness of a wine—can even say without further investigation whether or not the wine is sour, mawkish, flat, or bitter.

Fewer people, however, are endowed with that particular subtlety of palate which enables one to detect faint taints. To those who are so gifted, a systematic grouping of the impressions gathered by the senses of sight, smell, and taste, backed up by the sense of memory which enables one to assign to given symptoms their true value, are to a great degree helpful in tasting wine.

Although a wine taster, like a good cook, is born and not made, yet experience and practice both help in giving proficiency.

The Sense of Sight

Is the first that one appeals to in judging wine. Before venturing an opinion, the experienced taster looks at and thoroughly examines the wine, noting its "condition" or degree of brightness. If bright and brilliant, the wine has been well clarified and rid of those germs which might impair its quality. If, on the other hand, it is dull and cloudy, it is a sign that it has not completely purged its impurities, and unless carefully handled it might become diseased.

The orthodox recipient for judging the wine by its appearance is the plated tasting-cup. That cup is shallow and shows inside embossed knobs on which the wine is seen under different depths and over which the light rays play, reflecting the shades which constitute the colours of the wine.

An ordinary thin clear glass, however, is used by many, and affords as good results.

The foam and bubbles are observed and impart valuable indications; notes are made of their grouping round the edge of the cup or of the glass.

Then the degree of clearness of the wine is also observed and its colour noted.

The physical indications derived from the three senses of sight, smell, and taste have been carefully recorded by Prof. G. Grazzi-Soncini, of the School of Viticulture and Œnology of Conegliano. As these indications afford a valuable means of diagnosing wine diseases a review of them will prove useful.

FOAM is made up of small bubbles of gas, which run together when wine is poured out or is shaken, and float on the surface either in patches in the centre of the glass or in a ring which adheres to its edge.

The foam may appear as:

Fine beady foam, consisting of very small bubbles;

Large beady foam, made of larger bubbles;

Evanescent foam, which speedily disappears;

Persistent foam, the reverse of evanescent foam, and is the characteristic of a wine of low alcoholic strength, of wine kept at a low temperature. It may also indicate that the wine wants racking, and shows a tendency to work. It may be undergoing a slow fermentation. If that fermentation be alcoholic, it would be more beneficial than harmless, unless it proceeds beyond the desired limit in the body of a wine it is proposed to keep sweet. That fermentation, on the other hand, may be a "secondary" fermentation, and involve the transformation of cream of tartar or some other of the constituents of the wine itself. In that case it is a sign of disease.

The foam may be persistent by reason of the constant renewal on the surface of the gaseous bubbles which originate within the mass of the liquid whenever the pressure inside overcomes that of the surface. That foam may gather in a circle, either broken or complete, around the edge of the glass, or it may float in patches resembling a finger nail, and indicate a disease the French call the *Maladie de la Tourne.*

Sharp pungent foam shows when the quantity of carbonic acid gas in the wine is in excess of the temperature and of the surrounding pressure. It leaves a prickly sensation on the palate.

Frothy.—On pouring wine into a glass, a froth or scum spreads over the surface. In wines that have not been sufficiently racked, that have been bottled too young, when all the sugar had not been transformed into spirit—especially when kept in a hot place.

Sparkling.—On the contrary, the foam may be caused by an abundant escape of gaseous bubbles right through the mass of the liquid, rising to the surface. When it is kept on rising for a time, beady pearls are seen to rise from both the centre and the side of the glass, as occurs in champagne.

White Foam.—Often seen in immatured or in old red wine. The young red wines of some localities sometimes show white foam.

Pink Foam—which is often found on lightly coloured young red wines, is also characteristic of matured wines.

Red, Ruby Foam.—Familiar to young, full-bodied wines, deep in colour.

Bluish Foam.—Wines poor in acid, as in some blending wines, containing only three to four per 1,000 of acidity.

The CLEARNESS of the wine is next observed. A wine is more or less *limpid* according as to whether it is free or otherwise of any matter in suspension. There are, in clearness, degrees of comparison which can be noted.

Bright, Brilliant.—When the degree of clearness is such as to be perfect. A cloudy wine may be made bright either by fining or by filtering, or as the result of storing in a cool and even temperature.

Cloudy, Dull.—The reverse of clear and brilliant. There are degrees of dullness. Wines freshly racked often turn a little cloudy for a while, owing to the oxidation of some of the albuminoid matters they contain, more especially wine from fleshy grapes grown on rich flats, also wines poor in acids, and which have not completely fermented.

Turbid, Thick, Broken.—When the particles in suspension float about and make the wine opaque and scuddy. That defect may be transitory as in the case of a broken wine, when it may be restored to a clear state by blending with another wine, by fortifying, or by slight additions of tartaric acid.

It may, on the other hand, be permanent, and then it is caused by a disease, which must be treated by means of sulphuring, addition of tartaric acid, by filtering, fining, or by pasteurising. A young wine bottled too soon leaves a muddy deposit on the side of the bottle.

If the wine is diseased, it matters little whether the contents of the bottle be disturbed or not; but it may at times be sound, although it has cast a deposit in the bottle. Such wines are often served with the bottle resting in a cradle. It is preferable, however, whenever a sediment is seen, to slightly raise the bottle, leaning it as much as possible without disturbing it in the position it occupied in the wine bin; remove the cork without jerks and pour the clear wine into a decanter or into a clean bottle. Handy contrivances in the shape of small glass syphons are also very useful for separating the clear from the murky wine. Unless care be taken, the contents of the bottle will, after two or three glasses have been poured out, become turbid and uninviting.

Opalescent, Iridescent, is generally an indication of unsoundness, not infrequently due to the disease called in France *la pousse,* in which the tartaric fermentation takes place, the colouring matter being precipitated, and a silky, flocculent growth of microscopic rod-like bacilli float about the mass of the wine, which assumes a sickly, brick colour, and breaks the rays of light as they penetrate the wine, imparting a peculiar irridescent appearance.

This opalescence is best seen on the surface of the wine, and also around the glass.

As regards COLOUR, a wine is either colourless or discoloured. When colourless it has almost the appearance of pure water. This is obtained by very carefully handling white grapes, especially when over ripe; also by carefully pressing some black-skinned grapes before they commence to heat and ferment, as is the case in the manufacture of some champagne wine. The same result may also be obtained by running the grape-juice over specially purified animal charcoal.

Straw Colour.—A very common and pleasant colour.

Yellow.—A wine is yellow when it assumes a fairly dark straw colour. Some white wines possess naturally a yellow colour. Some contract it as the result of morbid changes in their constitutions. Those wines are more often subject to the yellow alteration which are poor in alcohol, cream of tartar, tartaric acid, and in tannin.

Some of these wines poor in acids contract, when exposed to the air, a brownish-yellow colouration, due to the formation of iron and of humic compounds.

Golden Yellow, as the name suggests; a pleasant colour.

Greenish, presenting a faint *Eau de Nil* colour, is characteristic of wine from certain varieties of grapes. Rhine wines often present that colour.

Rusty Yellow.—Often due to imperfectly cleansed wine casks and vessels.

Rose-coloured.—Not uncommon in white wines made from red grapes when they have been made with little care and when the grapes have been heated before being pressed. Imperfectly decolourised presses and casks should also impart that tint. It may also be a sign of artificial colouration.

Bluish-Brown or *Brown Yellow*, which the French call *Œil de Perdrix* (partridge-eye) is a sickly, dull, dark yellow, either due to a malady of the wine, caused by a mycoderm. It does not fine readily, and when looked at through a glass, it shows a bluish reflection. In that case, raise the alcoholic strength and then add 10 to 12 grammes (about three-quarters of an ounce) of tannin to the hogshead of wine, let it rest for a day or two, and fine with isinglass.

This discolouration is also sometimes caused by the presence of an excess of iron in white wines, or it is noted in wines made from grapes poor in tartaric and other acids natural to the grape, or, again, made from partially decayed grapes.

Dull indicates a diseased, badly made, or badly kept wine.

Light Red.—The French *Clairet* refers to red wines made either from unsuitable grapes, or often is the result of the additions of water.

Ruby.—Characteristic of the well-known Bordeaux or high-class claret wines.

Purple.—Is a ruby wine with a tinge of purple in it.

Garnet, Dark red.—Represented in the fuller wines as in Barbara wine, or in Burgundies. These wines are long keeping and with age show a tendency to acquire an orange tint.

Violet, Bluish.—Seen in some heavy, coarse blending wines in which the violet colouring matter is plentiful; this colouring matter readily precipitates. It is seen in Canajola wine and in wine made of such grapes as the Jacquez.

Orange, Yellowish red, Onion peel are tints which denote old wines and also decrepit wines.

Dark coloured wines have an excess of colouring matter; they are, as a class, harsh and indigestible.

(To be continued.)

POTATO CROP—FAILURE OF ON THE STIRLING ESTATE, AND SOME POTATO PESTS.

The Horticultuaal and Viticultural Expert (Mr. Despeissis) writes as follows to the Director of Agriculture:—

On the 12th April I visited, in company with Mr. A. G. Layman, of Capel, a portion of the Stirling Estate, and made an inspection of the swamp land under potatoes, to which reference is made in the attached correspondence.

The potato crop on that flat land is a failure, and the growers will hardly get "seed" back.

Before suggesting cures, it is important that the disease cause be determined, so as to lead to the successful application of remedial measures wherever possible.

A combination of several causes appear to have brought about that result, viz.:—

1st. The rawness of the soil, and in spots its unsuitability for such an exacting crop as the potato crop.

2nd. The rough-and-ready methods of cultivation.

3rd. The attacks of insect pests.

4th. The attacks of fungoid pests.

Rawness of the Soil.

For many years that flat country has been a marsh, until it was, quite recently, partly reclaimed by a system of drainage which favours the flow of the accumulated mass of surface fresh water in the spring, and bars the inrush of salt water after that fresh water has run out into the sea. Until this land was acquired by the State, and subdivided into blocks and sold, it carried nothing but bulrushes and couch grass. In its unreclaimed state, it carries vegetation only found on water-logged and sour ground. Where ploughed and dug and harrowed, a handful of decomposed vegetable mould, taken a few inches below the surface, lacks the fresh smell of sweet earth, and appears to be unduly charged yet with those acids which are found during the transformation of rotting vegetable matter into humus.

That impression is borne out by the chemical test and examination made by the Government Analyst, as shown in the analysis of the three samples of soil submitted to him. Root development under these conditions, it is evident, must be checked.

The Presence of Salt in the Ground

is also in evidence in spots, more especially near to the mouth of the drain.

After several months of dry weather, this is plainly indicated by a white incrustation on the surface. Here, again, the Government Analyst's report lends confirmation to the indications furnished by an inspection of the

ground. The amount of chlorine, according to the analysis, amounts to ·280, ·200, and ·124 respectively, or an average of $\frac{1}{5}$ of 1 per cent. Now, as the relation of chlorine to its sodium compound or common salt is as 35·3 is to 58·2, it follows that that ground contains $\frac{1}{3}$ of 1 per cent. of salt.

It is computed that the weight of an acre of soil one foot deep varies from $1\frac{1}{2}$ million pounds in peaty soil—the lightest—to $4\frac{3}{4}$ million pounds in sandy soil—the heaviest.

The ground here referred to is of a peaty nature, and it follows that ·3 of 1 per cent. of $1\frac{1}{2}$ million pounds of its weight is made up of salt, or, in other words, that ground contains $2\frac{1}{3}$ tons of salt per acre in its topmost slice one foot deep. Although this amount is a heavy one, there need be no fear, now that the drainage scheme is accomplished, that it will long prove a source of trouble. On the contrary, it is material to expect it will decrease as it is worked out to sea every year when the flow of rain water pushes open the flood gates, which have been erected to also prevent the invasion of the sea on to the land. In the meantime, that heavy dose of salt, even though it may not be too heavy to burn the crop, will materially deteriorate the quality of the potatoes raised, and tend to make them "waxy," as swamp-grown potatoes are.

I had an opportunity of tasting water from a shallow well only recently sunk and found it fresh. This tends to prove that there is no permanent store of salt in the ground, and that as the sea is now shut out, the source of supply has now run dry.

The Rough-and-ready Methods of Cultivation

referred to are also responsible in no small degree for the failure of the crop. It is barely six months since the ground was reclaimed from the water. The bull-rushes have been chopped down, the ground full of roots, harrowed several times, ploughed again, smoothed over as much as possible; the furrows were then opened, the ground fertilised, and the sets put in and covered.

It is reasonable to say that of all the farm crops grown the potato crop was the least suitable for virgin swamp land just reclaimed. A walk over the fields show the surface to be rough and made up of lumps of peaty stuff which are black when wet, but are now, at the end of the dry season, light in weight and in colour. Underneath and around the tubers the ground is dark, but it is also lumpy, and has not had time to crumble down to fine earth, as the roots and flags of the water plants are still rotting. Apart from the state of unpreparedness of the land in question for plants like potatoes, it also affords, as I indicate lower down, particularly easy means for the potato moth to reach the base of the stalk. It is apparent that the owners of the land must have spent much time and labour in reducing their ground to a fine tilth, but it is also evident that much of the work has not yet been crowned with the desired effect. Seasons and periodical cultivation will help considerably in reducing that coarse vegetation into fine friable mould, and instead of selecting potatoes as a pioneer crop for such raw land, I believe owners would be better advised in sowing some summer fodder crop, such as cow-peas, and feeding it off until the land is better prepared to grow such crops as onions and potatoes.

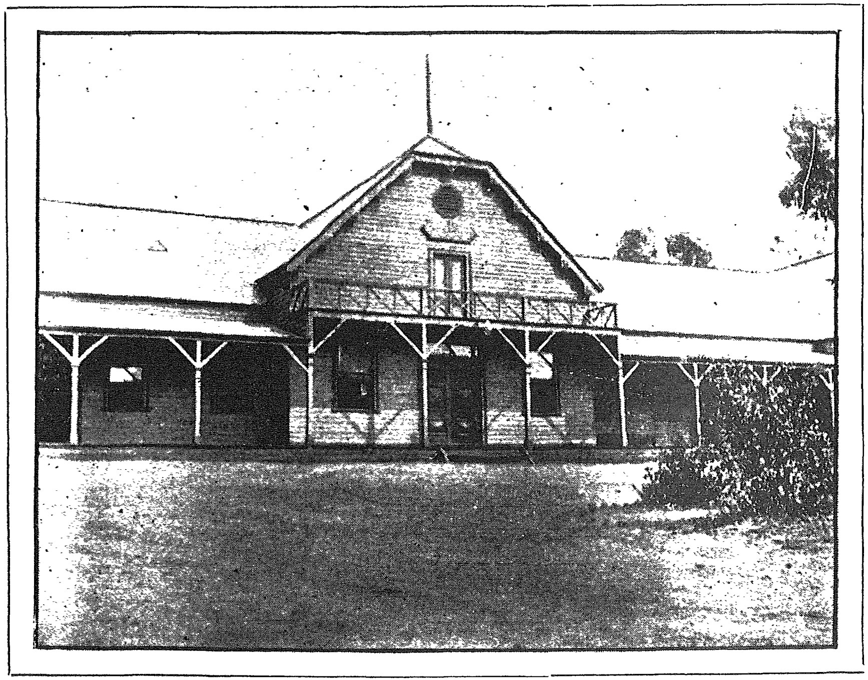


FIG. 1.—Central Buildings, Dookie Agricultural College.

The Attacks of Insect Pests

can in the main be reduced to one, that inflicted by the Potato moth. That insect is too widely distributed, and is so familiar to anyone who has ever grown or stored potatoes as to need description. It is as regards the *summer crop* the most serious pest affecting the potato, whether it is in the ground or in the store. This pest may be introduced into hitherto clean fields in either of the four stages which constitute its cycle of life, viz., in the egg stage, the larvæ or grub stage, the pupa or chrysalis stage, and as the winged or moth insect, and the potato growers raising a summer crop, when the pest is active, should take every precaution to guard against its introduction in either of these several forms. It is also well that he should know what are the crops the potato moth attacks.

Besides the potato itself, the potato grub (*Lita solanella, Boisd.*), which is common all over the country, has been observed feeding on tobacco, a plant of the same botanical order. A ride over the Stirling Estate soon reveals the fact that another closely allied plant, viz., the Thorn apple, or "Devil's Trumpet," is growing wild all through the bush. There is no observation on record, so far as I know, showing that the potato grub feeds on that plant, but it is a question which is worthy of investigation. As, on the other hand, it is known to harbour the fruit fly maggot through the winter months, and there is some possibility of also supporting the potato grub, it would be advisable to bring that useless plant under the scope of the "Noxious Weeds" Act, and enforce its eradication.

Rotation for Defence

should therefore be placed in the first line in fighting the potato grub. This will ensure its systematic starving out on potato land and also the suppression of those on plants which produce food for it.

Clean Seeds

should, in the second place, be secured. There is a strong feeling throughout the agricultural districts that infested seeds are often sent out to growers, and abuses are on that score freely levelled against produce merchants who act as intermediaries between farmer and farmer. More care on the part of the farmers themselves should greatly reduce that source of infestation. It is besides not always an easy matter to verify that statement, except when the seeds show on being cut, blackened galleries made by the grubs when they are eating through the tuber. At times, however, it is most difficult to ascertain whether the tubers carry eggs of the moth or not, as these are very small and generally laid upon or close to the eye of the potato.

These eggs are deposited by the moth penetrating through roughly prepared and lumpy ground from the surface to the tubers about the time these are fit to dig; also, and more frequently, when these are left exposed on the surface of the ground for a day or two after digging, and not uncommonly when the potatoes are spread out unprotected over the floor of the barn or of the storing shed.

It is evident, therefore, that digging, bagging, and storing must be done with the least possible delay. For long keeping, nothing but sound and unbruised potatoes should be bagged and the rest marketed and consumed at once. A liberal use of lime over the potatoes will also insure its better keeping and help in warding off moths and in checking moulds.

In addition to the planting of sound potatoes which have been quickly and carefully dug, limed, and bagged, some successful growers also advise sinking seeds under water for ten to twelve hours. Most of the grubs or pupæ present in the tubers will thus be killed.

Another precaution which should never be neglected consists in scalding or burning all potato bags when they come on the farm. The insects are often introduced in the pupæ or chrysalid stage attached to potatoe sacks into which they crawl after emerging from the wormy tuber. It may also happen that although a particular lot of potatoes is clean, the sacks have offered a convenient hiding place to grubs from a contiguous lot of wormy potatoes either when stacked on board ship, in railway trucks, or in the storing shed.

Traps

offer an easy and a successful means of killing great numbers of moths, more especially is such places as the flat swamp land on the Stirling Estate, where a dozen growers may have potato fields all adjacent to one another. Unlike the Codlin moth, the potato moth flies to a light, and advantage has been taken of that peculiarity for destroying tens of thousands of them.

For that purpose, a storm lantern is placed on a block of wood or on a brick, in the middle of a wide tin tray filled with water, over which floats a film of kerosene. Some farmers have also successfully used a tray filled with heavy oil carrying a floater or a clay holder through which is set a wick. An acetyline lamp over a similar tray should also prove useful, and would not be put out by the strong breeze that sometimes blows at night.

This method of coping with the pest should prove a useful one wherever the invasion comes from the neighbour's ground, and it should be preferred to "poisoning" with Paris Green when the potatoes are in leaf and when the moths frequently lay eggs upon the tender shoots, upon which the young grubs feed, and soon after bore into the haulms (stem), and either drop out full fed before they reach the ground, in which case the tubers are not damaged, or else they penetrate right down to the roots, where they pupate to emerge afterwards as full-grown moths.

It is advisable, however, to mix some Paris Green with the Copper washes mixture used in combating fungoid diseases which also at times attack the potato crop, and thus turn that spraying mixture into both an insecticide and a fungicide weapon. Some other insects which also prey on that crop would thus be reached, while some good would result even in the case of the potato moth grub.

Parasites.

In the light achieved in fighting some of our most troublesome garden pests in this State and also in California, there is good ground for believing that one of the most effective solutions of this potato moth trouble will be the introduction of a suitable parasite. The Government Entomologist, Mr. Compère, is now away searching for one, and every farmer and potato grower should urge upon the Government the desirability of continuing this prospecting work along with, if not in preference to, other similar investigations now being made.

The Attacks of Fungoid Pests.

The examination of the potato fields on the Stirling Estate also showed that in some cases the early decay of the plants is caused by a mould or

fungus which attacks the roots of the plant. The leaves themselves showed little evidence of the presence of a fungus pest, but some were curled and stunted, thus showing that the roots were affected. An examination of the ground around the diseased plants showed at times web-like threads of a mould. Dr. Cobb, when Vegetable Pathologist to the New South Wales Agricultural Department, made a careful study of this fungus, a macrosporium which also attacks tomatoes and chillies. The disease seems to start from the ground and to enter first the base of the stalk. This means of course that the fungas is already inside the plant and beyond the reach of fungicides.

The disease, says Dr. Cobb, is common in Australia as well as elsewhere, and is held in check by early spraying of copper washes, which should be applied before it shows. Bordeaux mixture and Burgundy mixture applied at intervals of two or three weeks from the time the crop is a few inches high, will stay the progress of this as well as of several others caused by parasitic fungi.

Some potatoes I dug out were attacked by another disease also of fungoid origin, well known under the name of "scab." On exposure to the surface after digging, the surface of the affected tubers roughens and becomes warty and scabby. The fungus can remain in the soil for several years, where it lies lurking for fresh sowings. No scab appears in clean ground sown with clean seeds.

Whenever any doubt exists regarding the freedom of the potato seeds from the disease, it is a good plan to dip them for one hour and a half in a 1 per 1,000 solution of corrosive sublimate (2ozs. of the poison in 14 gallons of water) or else in a less dangerous dip made of formalin 40 per cent. 1lb. and water 30 gallons.

If the seeds are dried afterwards in lime and sulphur mixed, they will be further protected against infection by some other diseases.

Immature Seeds.

Apart from the several causes which I have enumerated as having singly or collectively brought about the failure of the potato crop, I also learned in collecting evidence that, more from necessity than from chance, growers use what are practically "new potatoes" for sowing these swamps. Most of that land cannot be ploughed much before Christmas, and spring-grown potatoes are then about the only seeds procurable. These are dug in November and December, and when the time for planting the swamp crop comes, after the New Year, the eyes are still dormant and backward. The sets are nevertheless planted as soon as the land can be got ready, and it is in this wet, unsweetened soil that they sprout and grow. The crop, instead of showing above ground within a couple of weeks or so of planting, is often out of sight for a month, during which time the sets are to some extent attacked by rots and moulds. Some decay in the ground; others give rise to weakly plants which have not the strength to stand the disease.

The problem, therefore, is how best to keep seeds over a long period in order to have them ready when required. The first essential is to carefully sort out the potatoes it is intended to put by for long keeping, rejecting any tuber showing signs of bruises or injury. This preparation reduces the danger of rotting and infecting the sound tubers around.

Some farmers—amongst the most successful—cover with lime their tubers before putting them away, and there is no doubt that a small addition of sulphur to that lime would be of value in keeping off insects and in checking some of the fungi which prey on the potato crop later on. This method has been followed with satisfactory results by Mr. Berthoud at the Government Experimental Station at Hamel.

The record of the following experiment carried out in France shows in concrete figures the value of the lime treatment in connection with the sound keeping of potatoes.

Sound potatoes carefully selected and limed have thus turned out:—

50 kilos unsorted.	50 kilos sorted.	50 kilos sorted add sprinkled with Lime.
5th October, 50 kilos	50 kilos ...	50 kilos
31st March, sound, 36·5 kilos ...	40 „ ...	47·5 „
„ rotten, 13·5 kilos ...	10 „ ...	2·5 „
Loss, 27°/₀	20°/₀ ...	

In conjunction with the sorting and liming, it would, it is sound to infer, be good policy to store seed potatoes from the main crop in dry, cool chambers for a period of from five to six months, and then place them in warm, dark rooms to force the sprouting previously to planting.

WESTRALIAN APPLES.

Under this heading the local Press published a few days ago the following items of intelligence respecting the result in the sale room of the first two small shipments of apples sent this year.

The first, consisting of 150 cases, went to London, and the second, amounting to 160 cases, was consigned to Bremen:—

London, April 26.

The West Australian apples by the R.M.S. "Mongolia" fetched from 7s. 6d. to 15s. 6d. per case, while a few cases of Cleopatra went as high as 18s. to 23s. Some of the Jonathans were small and spotty.

London, May 1.

Apples.—The "Friedrich der Grosse's" apples and the South Australian apples shipped by the "Bremen" realised from 10s. to 17s. 6d. per case, while a few West Australians fetched from 14s. to 21s.

Commenting on this second cablegram, the Agent General advised as follows:—

> "Apples *ex* 'Friedrich der Grosse' have been sold at Bremen, realising first-class prices, averaging £1 1s. 6d. per case, after keen competition. Broker states he could sell 10,000 to 20,000 cases such apples. We are arranging about shipment per steamer 'Bremen.'"

Mr. H. G. Barker, the Perth representative of the Norddeutscher-Lloyd Co., when spoken to with regard to the shipment of apples to Bremen, said that the shipment by the "Friedrich der Grosse" comprised consignments from the Darling Ranges and the Donnybrook, Cranbrook, and Mt. Barker districts. The cost of delivering the apples in Bremen from the orchard, including wrapping paper, cases, nails, railage of empties to the orchards, railage of full cases to Fremantle, cartage, branding, wharfage, marine insurance, and freight was, in the case of the Darling Ranges apples, 4s. 10d. per case, Donnybrook 5s. 1d., Cranbrook 5s. 5d., and Mount Barker 5s. 6d., and as the fruit fetched £1 1s. 6d. per case there was a large net profit on the transaction.

The fruit by the "Bremen" which was referred to in the cablegram consisted of 120 cases, and was the competitive shipment for the Government prize.

When detailed reports from the fruit brokers in London and Germany come to hand they will be duly published for general information.

DISTRICT NOTES.

WAROONA DISTRICT.

By Inspector S. H. Whittaker.

While fully recognising the beneficial effects of ringbarking timber on the better classes of land in the South-West I beg to draw attention to the pernicious effects of the practice on scrubby, sandy, or jarrah country where the destruction of the trees only promotes the growth of suckers and saplings without producing grass. While the timber is in the green state on the latter class of soils it can be made profitable for grazing by freely burning it, but when the trees are killed there is no longer the annual shedding of foliage, which drying, carry fire, and the scrub is kept in a succulent and wholesome condition. After the timber is dead fire will not travel as often as it is needed either for the benefit of stock or to destroy rubbish, saplings, and suckers. The ground to which I have referred being either second or third class does not pay for keeping clean with the grub

hoe, and the use of the axe only produces, after every lopping, a still more luxuriant crop of undergrowth, so that finally ringbarking has done much more harm than good. This is especially so because the ironstone gravelly land to which I particularly refer is only to be cleared and cultivated at a profit by the orchardist. The farmer can only economically deal with it for paddocking, and it has been proved that if the blackboys are chopped it will sustain more stock if the forest is left virgin and "a good burn" is relied upon. Where silver or other grasses can be encouraged, that is in redgum country on chocolate loams, ringing is of course one of the first things a a settler should do.

GERALDTON DISTRICT.

By Inspector J. T. Barrow.

I have the honour to forward, attached hereto, my diary for the month ending 30th April.

During the month I had to proceed to the Geraldton district to deal with a number of urgent Agricultural Bank cases, and the work in my own district has consequently accumulated considerably.

During my tour through the Bowes and Appertarra Agricultural Areas I was struck with the satisfactory development that is taking place in those parts. Large tracts of land are being cleared for cultivation where hitherto nothing but a few head of stock were to be seen. The fact is that land around Northampton has recently become very popular, as a consequence of some particularly good results obtained by several resident farmers. The country was looking rather dry at the time of my visit, but settlers generally were not at all disconcerted at the fact, most of them preferring that the rain would hold off till May, as, in that case, they considered it would probably be continuous, and enable them to go straight ahead with their ploughing, whereas they held that early rains were generally followed by a break of fine weather which dried everything up again. Northampton and the surrounding country is specially favoured in being able to look at matters in this light, as it is not dependent upon the rainfall for water, which can be obtained almost anywhere at a shallow depth.

Settlers continue to recognise the advantages offered by that institution in the way of nursing them through the initial and developing stages of their settlement.

During my recent rounds amongst small holders I have also visited De Burgh's station, on the Moore River, and Roberts' well-known Yatheroo Estate, at Dandarragan, and it was gratifying to note the abundance of feed and water and the excellent condition of stock on these places. I was particularly struck with the excellent arrangements provided at Dandarragan for watering stock, the water, in all cases, being conveyed through pipes into troughs of ample length, with the source of supply substantially fenced off, so that none of the surface waters are stirred up or polluted by cattle or sheep as was the case in the olden days.

In my last quarterly report I suggested that the Agricultural Department might, with advantage, establish—under its own control—small trial plots of various kinds of grasses within the boundaries of promiscuously chosen sandy holdings, the trials, of course, to be made with the approval and co-operation of the various owners upon whose land the experiments

were made. I find that my suggestions on this subject are referred to in the February number of the *Journal of Agriculture*, when it is pointed out, as a set off, that thousands of lots of seed have been sent out in the past, yet only a few have ever supplied the Department with any information as to results.

I think it is quite probable that in the majority of cases the results were *nil*, and I am, therefore, all the stronger of the opinion that it would be more satisfactory if an expert were told off by the Agricultural Department to make a speciality of this matter, and by direct supervision and personal attention bring about a desirable change in the stock-carrying capabilities of the sandy and poorer classes of our soils.

As this State embraces such a large extent of sandy country, which at present produces very little feed of any kind, I think the Agricultural Department should devote more attention to this class of land than to the more fertile patches of our territory, because the possibilities of the sandy soils have not yet been satisfactorily ascertained or demonstrated, whilst on the richer soils, any practical farmer could produce crops and vegetation to advantage, even though there were no Department of Agriculture in existence.

[The above suggestion is good, but comes late, as during the past year the Department has made many experiments with grasses in the sandy soils in various parts of the State. At the Subiaco Quarantine Ground the results achieved with imported grasses have been extraordinary, and bears an evidence of the capacity of this class of sandy soil which, under ordinary observation, the farmer would probably abandon as useless for such a purpose. There is evidently potentialities in the sand-plains of the State not yet realised. This year the Department imported grass seed, and has already distributed large quantities in the aggregate to farmers throughout the State for experimental purposes.—Ed. *Journal*.]

KATANNING DISTRICT.

By Inspector J. F. Moore.

I beg to submit the following brief report for the quarter ending 28th February, 1906. During that period farmers have been busy with their harvest, and I think that when the returns are made known they will be found quite up to expectations, but that the area cut for hay is much greater than was formerly intended.

A very heavy fall of rain occurred on the 21st of February, softening the ground in places to such an extent that some of the settlers have had the plough at work, showing that they do not intend to be caught napping this year as they were last; such early ploughing will, of course, give the weeds a big start over the grain to be sown later, but I presume they prefer that rather than not get it in at all.

A large quantity of mallet bark has been carted into Katanning and sent away by rail. This very important industry is nearing the end of its existence in this district, there being but small patches left now that are within easy distance of the railway. Many of the settlers will regret this very much, as during the past two years a large number have been practically placed on a sound footing from the amounts received from the sale of mallet bark; indeed so ready were they to take advantage of the industry and make a few pounds quickly that they have neglected to comply with the conditions under which they hold their land, more particularly the

fencing. But I think that, knowing the circumstances, it would be a graceful act on the part of the Hon. the Minister to consider them exempt from such conditions during the period mentioned, and I feel sure that it would be very much appreciated by them and that they would make a fresh start, sounder financially and with better heart, and try in the future to comply with the Act under which they hold their selections.

The fact that the survey of the proposed railway line from Katanning to Kojonup is in progress has caused quite a boom in land settlement in the West, and the ancient village, Kojonup, to be looked upon as a place of some importance. Indeed, so much so, that the National Bank, with its usual enterprise, has opened a branch there, much to the delight and benefit of the townspeople.

The roads both east and west are very much cut up owing to the heavy traffic recently carried over them in the shape of mallet bark and grain.

The Agricultural Bank still retains its popularity, settlers duly appreciating its liberal terms and the promptness with which their applications are dealt with.

NORTHAM DISTRICT.

By Inspector E. Howard Gliddon.

I beg to submit my quarterly report for the three months ending 28th, February 1906:—

During the quarter under review my duties have taken me to every part of my district, which, as you know, is a very large one, and, generally, everything looks promising; the crops in nearly all cases exceeded expectations, and settlers are now making preparations for putting in their crops for this year, the cultivator being in great requisition, and in the earlier portions of the district, viz., around Kellerberrin, Waeel, Doodlakine, and Tammin seeding is likely to become general within a week, and in a few instances has already commenced.

Meckering Agricultural Area.—The most important work carried out during the quarter has been the general inspection of the Meckering Agricultural Area, and the figures below sspeak for themselves; 25,204 acres which are in course of alienation were inspected, and out of this area not less than

12,117 acres are cleared, at a cost of 40s. per acre ...	£24,234
11,922 „ cultivated „ 10s. „ ...	5,963
4,666 „ ring-barked „ 2s. „ ...	466
20,034 chains of subdivisional fencing erected, at 6s. per diem	610
18,664 chains of boundary fencing erected, at 4s. per diem	3,732
Value of Buildings	5,010
Value of Water Conservation	2,629
Total	£44,644

or an average of 34s. 10d. per acre. Large areas of land have already been alienated, viz., the holdings of Messrs. E. W. Carter, W. Murray, Millington and others, and I may safely say that Meckering Agricultural Area is the largest and most flourishing agricultural area in the State.

Kellerberrin District.—It is most pleasing and interesting to see the tremendous settlement that is taking place along the Goldfields Railway line,

especially around Kellerberrin, Doodlakine, Tammin, and Cunderdin; new settlers are to be seen everywhere, and clearing and preparing for the seeding operations is being carried on with great vigour. The town of Kellerberrin is going ahead and new business of all descriptions opening out. Quite 3,000 acres of new land will be brought under cultivation this season, within a 10-mile radius of Kellerberrin, and about the same in and around Tammin and Cunderdin; the reservation (temporarily) of the land south of Kellerberrin has checked the settlement in this part of district, although inquiries are being made, and when seeding is over I think very large areas will be applied for.

Goomalling-Cowcowing.—Good settlement has also taken place in this portion of the district, and now that the railway to Dowerin has been promised great things are expected, and will undoubtedly bring the splendid Dowerin and Koombekine country into great prominence. No railway will give greater assistance to a large area at present worked against very great disadvantages, and will mean a tremendous addition to area under crop. The country around the Wongan Hills is also being well settled, and if the Dowerin line is extended to Koombekine, thence towards this part of the district, there is a great future in store for the settlers.

Until the railway has been constructed as far as Dowerin, I am afraid that the Cowcowing settlers will have a very hard struggle.

The establishment of the bacon curing industry in this State, will be greatly appreciated in this district, and the attention of many farmers turned to the raising of pigs, the district being well suited for mixed farming.

The operations of the Agricultural Bank are being extended right through the district, and a great part of my time is spent doing Bank work, and general satisfaction is also expressed by those who are borrowing.

THE FERTILISERS AND FEEDINGSTUFFS ACT.

By Percy G. Wicken, Inspector of Fertilisers.

The Amended Act to control the sale of Fertilisers and Feeding Stuffs came into force on 1st May, and regulations were published in the *Government Gazette* callng on all dealers in fertilisers to register their brands by that date. A Fertiliser Act has been in force for some years past, but as it called on the purchaser to take the samples in the presence of a police constable or justice of the peace and forward them up for analyses at their own risk, it was very little availed of. Under the Amended Act recently brought into force, all dealers are called on to register their brands, and the percentage of fertilising ingredients they contain. Section 4 of the Act reads:—It shall be unlawful to sell, exhibit, or offer for sale any fertiliser unless—

(1.) The brand of such fertiliser; and

(2.) The minimum percentages of nitrogen, potash in readily soluble form, water soluble phosphoric acid, citrate soluble phosphoric acid, acid soluble phosphoric acid, and moisture contained in such fertiliser

are registered in the prescribed manner at the Department of Agriculture in Perth.

The term "Dealer" means any person who carries on business as a manufacturer, importer, vendor, or dealer in any fertiliser or food for cattle for purposes of trade, and whether such person carries on any other business or trade or not.

Section 5 provides that the particulars of any registered brand may be published in the *Government Gazette* or in any other manner the Minister may think fit.

Section 7 states that sack, barrel, or package containing fertiliser, must have the brand of the fertiliser durably affixed thereto.

Section 8 states--Every person who sells any fertiliser in any quantity not less than half-a-hundredweight—

(1.) Shall at the time of the sale or delivery of the fertiliser or any part thereof to the purchaser, give to the purchaser an invoice certificate in the prescribed form signed by the seller or his agent, stating:—

(*a.*) The name and place of business of the seller;

(*b.*) The registered brand of the fertiliser;

(*c.*) The quantity sold;

(*d.*) The minimum percentages of nitrogen potash in readily soluble form, water soluble phosphoric acid, citrate soluble phosphoric acid, acid soluble phosphoric acid, and of moisture, or of such of them as the fertiliser contains, which shall in every case be not less than the minimum percentages thereof as registered with the brands; and

(2.) Shall before delivery, durably mark or brand upon or durably affix to, or cause to be durably marked or branded upon or durably affixed thereto, every sack, barrel, case, or other package containing any portion of such fertiliser delivered in pursuance of such sale, the registered brand of the fertiliser.

Section II. further states:—Every person who sells, or exhibits or offers for sale, or who has in his possession, management, control, or direction, any fertiliser which contains a smaller percentage of nitrogen, potash, in readily soluble form, water, soluble phosphoric acid, citrate soluble phosphoric acid, or acid soluble phosphoric acid, than the percentages thereof as registered with the registered brand of the fertiliser shall, if the deficiency is greater than one-half per centum of nitrogen, one-half per centum of potash in readily soluble form, or one and one-half per centum of phosphoric acid, whether water soluble phosphoric acid, citrate soluble phosphoric acid, or acid soluble phosphoric acid, separately or total, commits an offence against this Act.

Section 14 defines the power of Inspector and states :—Any inspector may, at any time, in the daytime, enter any manufactory warehouse, store, shop, building, or place where any fertiliser or food for cattle is manufactured, kept, or exposed for sale, and demand and take samples thereof.

Section 16 provides:—The result of the analysis of any sample of fertiliser or food for cattle taken by any inspector, together with the name and address of the dealer from whom the sample was obtained, may be published in the *Government Gazette*, and in such other manner as the Minister may think fit, and a statement of the result of any analysis shall be sent by post forthwith to the dealer from whom the sample was taken.

As the Act has now been brought into force as soon as sufficient time has elapsed to allow all dealers to register their brands in accordance with the regulations, steps will be taken to obtain samples of all fertilisers for analysis, the results of which will be published in due course. The attention of dealers is called to the fact that the Act provides for a penalty not exceeding fifty pounds, for selling, exhibiting, or offering for sale any fertiliser unless it is registered in the prescribed form at the Department of Agriculture.

With regard to feeding stuffs, Section 10 of the Act states:—

10. (1.) Every person who sells, for use as food for cattle, any article which has been artificially prepared, shall give to the purchaser an invoice certificate stating the name of the article, the percentages of nutritive or other ingredients contained therein, and whether it has been prepared from one substance or seed, or from more than one substance or seed, and such invoice shall have effect as a warranty by the seller of the statements contained therein.

(2.) Where any article sold for use as food for cattle is sold under a name or description implying that it is prepared from any particular substance, or from two or more particular substances, or is the product of any particular seed, or of two or more particular seeds, and without any indication that it is mixed or compounded with any other substance or seed, there shall be an implied warranty by the seller that it is pure, that is to say, is prepared from that substance or those substances only, or is a product of that seed or those seeds only.

(3.) On the sale of any article for use as food for cattle, there shall be implied a warranty by the seller that the article is suitable for feeding purposes.

(4.) Any statement by the seller of the percentages of nutritive or other ingredients contained in any article sold for use as food for cattle, made in an invoice certificate of such article, or in any circular or advertisement descriptive of such article, shall have effect as a warranty by the seller.

POULTRY NOTES.

By Frank H. Robertson.

EGG-LAYING COMPETITION AT NARROGIN.

The first Egg Laying Competition to be held in this State was commenced at the State Farm, Narrogin, on the 1st of May. There were 38 entries, but as pens were provided for 25 lots only, there were thirteen poultry keepers thrown out at the ballot. This is no doubt a great disappointment to the rejected competitors, but it is to be hoped that the next competition will provide accommodation for at least double the number of birds.

The following are the Rules under which the Competition is worked:—

1. The competition to extend over the period from 1st May, 1906, to 30th April, 1907, inclusive; competitors to deliver their birds at the Narrogin State Farm between 26th and 30th April.
2. Each pen to consist of six pure bred hens or pullets.
3. All birds to be the property of the competitor, who has resided in West Australia for a period of not less than twelve months prior to the 1st May, 1906.
4. Any bird found to be suffering from an infectious or contageous disease, when delivered at the State Farm, Narrogin, to be rejected, and replaced by the competitor.
5. The poultry expert shall reject any bird that is not a fair specimen of the breed entered, and such bird must be replaced.
6. One wing of each fowl must be cut by the owner before forwarding to the State Farm. The wing will be kept cut during the currency of the competition.
7. In the event of a bird dying, becoming deceased, or incapacitated from laying, the competitor must replace it with another of the same breed upon being notified.
8. All eggs to become the property of the Department of Agriculture.
9. Eggs under 1½ ozs. in weight or otherwise unmarketable not to be counted.
10. Any pen, the eggs from which do not attain an average weight of 22 ozs. per dozen after the first three months of the competition to be ineligible for a prize.
11. The competition to be decided by the total number of eggs laid by each pen of fowls.
12. The market value of the eggs from each pen to be recorded, and prizes given for the greatest total value.
13. Prizes awarded as follows:—

    Greatest number of eggs in the twelve months: 1st prize, £10; 2nd prize, £5; third prize, £2.

For the first three months (Winter Test)—Greatest number of eggs: 1st prize, £3; 2nd prize, £2; 3rd prize, £1.

For the greatest market value of eggs: 1st prize £3; 2nd prize, £2; 3rd prize, £1.

For the greatest number of eggs during the last three months of competition: 1st prize, £3; 2nd prize, £2; 3rd prize, £1.

14. Records to be kept of the total quantities of the various foods consumed, and the average cost per head.

15. No competitor to be allowed to withdraw any bird until the termination of the competition.

16. Any competitor violating or failing to conform to these regulations will be subject to such disqualification as the Director of Agriculture may think fit.

17. The Director of Agriculture's decision in all matters of dispute to be final.

18. Leg rings indicative of competitors' entrance number will be provided.

19. Competitors must make their own arrangements for transit, and forward the birds to Narrogin Railway Station, carriage paid, consigned to the Manager, State Farm, who must be advised of the despatch of the birds. To prevent confusion, the sender must mark his or her name plainly on the coop.

20. Entries close at Narrogin State Farm on 20th April, 1906, at 4·30 p.m. Entrance, 10s. per pen.

21. The competitions to be restricted to 25 pens, and should entries exceed this number, a ballot will be taken to determine the list of competitors, and applicants notified of results immediately.

The following is the list of competitors:—

Pen No.

1. R. G. Flynn, Leederville, White Leghorns.
2. Mrs. R. A. Dusting, Leederville, Brown Leghorns.
3. F. J. Williams, Subiaco, White Leghorns.
4. Sparks and Bonnington, Cottesloe, Black Orpingtons.
5. C. W. Johnson, Leederville, White Leghorns.
6. Adelaide Poultry Yards, Gingin, Rose Comb Brown Leghorns.
7. Mrs. A. Bristow, Armadale, White Leghorns.
8. Miss Buttsworth, Cottesloe Beach, Silver Wyandottes.
9. G. Oneto, Cannington, White Leghorns.
10. A. H. Hilton, Cottesloe, Buff Orpingtons.
11. Averley Poultry Yard, Woodlupine, White Leghorns.
12. E. E. Ranford, West Perth, Brown Leghorns.
13. Perth Poultry Yards, Victoria Park, Black Orpingtons.
14. F. Piaggio, Guildford, White Leghorns.
15. Mrs. S. J. Hood, North Perth, White Wyandottes.
16. A. M. Nitschke, Bridgetown, Silver Wyandottes.
17. John Handley, Korijekup, White Leghorns.
18. W. J. Craig, Beverley, Golden Wyandottes.
19. Miss M. Parker, Woodlupine. White Leghorns.
20. J. D. Wilson, Crawley, Brown Leghorns.
21. J. E. Tull, Trafalgar, White Leghorns.
22. G. W. G. Lizars, Perth, Silver Wyandottes.
23. A. F. Spencer, Bunbury, White Leghorns.
24. E. Krachler, Bunbury, Rose Comb Brown Leghorns.
25. O. C. Rath, Harvey, White Leghorns.

The birds all arrived safely at Narrogin, and in good condition considering the long journey many of them had to undergo, but their owners packed them very well. All coops were provided with water tins, and overcrowding carefully avoided. The birds, taken all round, are a likely-looking lot to give a good account of themselves, especially the white and brown Leghorns, several very bright and active-looking birds being among these varieties. At this early stage of events it is quite impossible to form any idea as to ultimate results, but if getting to work quickly is any guide, the pen of silver Wyandottes owned by Miss Buttsworth are (at the time of writing, viz., 10th May) making a good commencement, having laid from three to five eggs each day since they have been here. The birds should give a good egg supply, as all the conditions are favourable. The runs, which are each 16 feet by 40 feet, are on sandy soil with a gradual fall to the east. Comfortable iron houses are provided with scratching pens attached, and as the first two feet of each run is iron to a height of two feet, the birds are well protected from the cold winds which blow in this elevated locality during the winter months.

The farm poultry are all doing well and getting nicely through the moult. The following breeding pens have been made up, viz.:—Silver Wyandottes, white Leghorns, Plymouth Rocks, and brown Leghorns. Eggs are not numerous; still a sufficient number are in hand to make a start with one of the incubators. The Pekin ducks, Toulouse geese, and bronze turkeys are all looking in the pink of condition. The young stock are thriving well; and in the new breeding runs the birds will do much better.

The stock for sale, at present, consist of white Leghorn, silver Wyandotte, and Plymouth Rock cockerels, bronze turkeys, and Toulouse geese and Pekin drakes; no pullets are for sale, as they are all required for stock purposes. Eggs for setting will shortly be available, at 12s. 6d. a setting of 12, delivered to any part of the State. The prices for cockerels are from 10s. to 20s. each, according to quality; bronze gobblers, 20s.; hens, 15s. each, delivered.

CROSS-BRED POULTRY.

The crossing of two different varieties of fowls is greatly preferred by many persons to the raising of pure-breds. Their reasons for so doing are frequently very hazy, so, for the information of all interested in this phase of aviculture, the following able article by "E.P.," taken from the *Feathered World*, will be found a valuable treatise on the subject:—

"Anyone writing on this subject has to be very careful what he pens, or the chances are that he will tread upon somebody's favourite corn—I mean cross—and thereby bring down upon his cranium the full force of the owner's indignation, righteous or otherwise. Some people will swear by one cross, and some by another, and neither will concede that any other cross is likely to come within hailing distance of their own particular selection. Others abhor crosses of every description, and so one is really between a certain somewhat unpopular individual and the deep sea.

"For myself, I can hardly see where the advantage is derived from such crosses as, say, Minorca and Leghorn, or Wyandotte and Orpington, although some people seem to consider them excellent, but not many can point out any decided advantage accruing therefrom. The only advantage

one can see in crosses of this description is in the increased stamina of the resultant progeny, for the general characteristics of each of the breeds employed are very similar, and I think this result could be achieved by the selection of a male from a totally unrelated strain of the same variety as the hens, thus introducing fresh blood, and at the same time preserving the purity of the breed.

"Except for crosses mated for certain specific purposes, I must confess to a decided leaning towards the sight of a pen of pure-bred birds in preference to a pen of multi-coloured cross-breds. There is a certain amount of satisfaction to be derived from the possession of a flock of birds of a uniform colour, which is absent in the other case. Besides, the pure birds are usually to be valued at at least double the amount which can be reckoned for crossbreds, and as they cost no more to rear to maturity, this should be an additional incentive to breed pure birds.

"Many of our pure breeds are now brought to such a state of perfection as regards their laying capabilities that it will be difficult to find cross-breeds, however much they may be improved by the process of crossing, to come up to the standard of, say, such birds as the winning pens at the various laying competitions. It would be interesting to have a laying competition on similar lines to those recently held with a view to testing the qualities of some of the genuine first-crosses, and to compare the results with the records made by the pure-bred birds.

"Apart from such considerations as those just mentioned, and others purely personal in character, there are many matings which will tend to increase or improve the qualities of different breeds in certain definite directions, such as the improvement of size in the lighter breeds and the producing of an improved quality of table poultry. The laying propensities of some breeds may also benefit by judicious mating, as may also the increased production of eggs from certain varieties at different seasons of the year, although the latter is probably more influenced by the condition and treatment of the birds than by the effect of the cross-breeding. For the production of table fowls we have several methods of mating, the best known and most generally favoured one being the Indian Game-Dorking and the Indian Game-Orpington crosses. These crosses give a large-framed, well-fleshed bird, with good feeding qualities, but rather inclined to a certain amount of coarseness in the bone. There is also a tendency in some cases to a slight yellowness in skin and fat, traceable to the male side of the mating.

"Another mating, which does away almost entirely with the yellow cast in the skin, is a cross between a white-legged Old English Game cock and white Orpington or Dorking hens, and it also tends to keep down the amount of bone. In addition to this, this cross secures a square-shaped, plump-looking bird when well finished, a type which obtains much favour in high-class markets, a slight reduction in size being about the only offset, but this is so slight as to be hardly worthy of consideration, as there is, if anything, an increase in the amount of flesh carried.

"Besides the crossing of birds solely for table purposes, the only other matings really worth considering are the crossing of the lighter breeds with a view to increasing the size, and the crossing of the heavier and poorer-laying breeds in order to improve the egg supply. By crossing the average Rock or Orpington hen with a Houdan, Minorca, or Leghorn cock, an increase in the egg supply from the pullets produced may be obtained, but as a rule the size is in some degree reduced. By reversing the mating, and crossing

Leghorn or Minorca hens with a Houdan cock, or a male of one of the heavier breeds, the size of the progeny may be considerably increased—that is, compared with the size of the female side of the mating, and their laying powers are little, if any, decreased, always provided that the male chosen to head the breeding pen is from a reliable laying strain. This question of strain is of the utmost importance when breeding for laying qualities, and it is almost useless to attempt to improve the birds in this direction unless the laying propensities of at least one side of the mating are known. To select a male of a heavy breed to mate with, for instance, Leghorn hens, without any regard to the laying powers of ths parent strain, is to grope in the dark, as it were, the result being almost purely a matter of chance. Instead of improving it would probably result in greatly impairing the all-important egg yield.

"A most popular mating is that of a Rock cock with white Leghorn hens, which cross produces smart-looking birds, the pullets as a rule coming white, ticked or splashed with black or grey, and the majority of the cockerels taking their ground colour from the male, whether barred or buff, intermingled with white feathers. The combs of the pullets are usually of a medium size, thereby lessening the chances of frost-bite, and making them somewhat more indifferent to cold as compared with the larger combed pure Leghorn. A cross which is just coming steadily into favour, and deservedly so, is a pen of black Rock hens mated to a good-sized black Leghorn male. Black Rocks are really sports from the barred Rocks, usually produced in a considerable proportion from hens mated for cockerel breeding, but they are now being taken up by fanciers and bred with some success as a new variety. Handsome fowl they look, too, when in condition, and should soon become popular. The birds produced from a mating of this variety with black Leghorns make a most useful laying cross, and in addition are very hardy, quick growers, and early in coming to maturity. A flock of black Leghorn-black Rock pullets are really a pleasure to the owner if only for appearance sake, and when this cross becomes better known it is sure to displace many of the now popular crosses, which only produce birds of a mongrelified appearance, if I may coin the word.

"The Minorca-Orpington, the Andalusian-Orpington, and the Houdan-Orpington are much in favour at present, and are considered by those who have kept them to be fairly good layers and decent table fowl; but the variety of shape and colour—especially from the two last named crosses! Ranging in various shades of colour from a dirty white to a dingy black or yellow, there is little that is pleasing to the eye in their appearance, and to compare the offspring of what might be a really decent pen of Orpingtons, saving the cross, with their parents—well, what would the much respected originator of the popular Orpington family think could he see how his patient work of a lifetime is often undone in a single season?

"Where any real advantage is derived from crossing, by all means let us have the cross, but let us avoid such promiscuous crossing as much of that at present in vogue, and, where crossing is resorted to, try to select the mating from such birds as will tend in some degree to produce uniformity in colour and type."

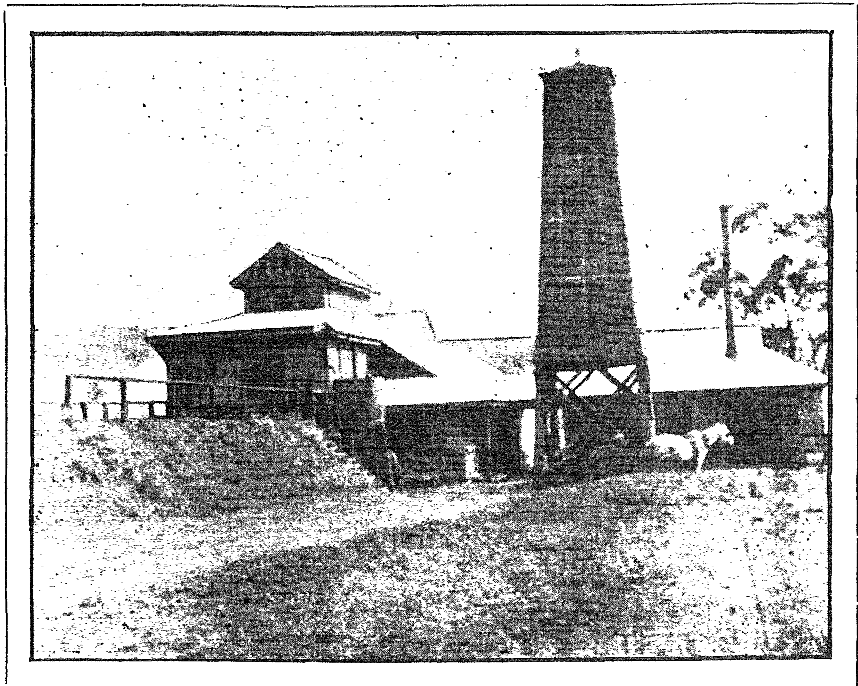


FIG. 2.—Louvre Tower used for cooling water for use in Dairy at Dookie Agricultural College.

POTATO CULTURE.

By T. I. Wallas,

Bacteriologist and Pathologist (Acting) to the Department of Agriculture.

Complaints have reached the Department of Agriculture of the failure of potato crops, and of the prevalence of disease.

Investigations have been made in several districts, and it has been found that, in a few instances, crops have failed.

The reasons for the failures are: (1) the crudeness of the soil, (2) imperfect methods, amounting, in some cases, almost to absence of cultivation, (3) attacks of fungoid and insect pests.

The land of one district inspected appears to have been only recently reclaimed from the sea, and it is still, more or less, in the condition of salt swamp.

It has not been effectively broken up and cultivated. In fact, there has not been time, in the course of nature, to prepare the land for any crop with hope of successful result.

Such land wants exposing, for a considerable depth and time, to the effects of sun and air, in order to dry and sweeten it, and render possible the chemical and bacterial action which must proceed in order to make available the stores of plant food in the soil. Until that is done, a successful yield of any crop cannot be expected.

In consequence of these unfavourable conditions, such crops as have been planted have been weak and incapable of resisting attacks of fungoid and insect pests.

Experience is gained in a hard school; but, surely, it is unreasonable to expect land, which for ages has been a sea-washed swamp, the vegetation of which, even in the most favourable seasons, is only rushes and coarse salt-loving plants, to yield, unaided and untilled, a crop of anything which demands ordinary care and cultivation.

In other districts better conditions prevail, and the few failures of crops which have occurred are due to faulty cultivation, too-early planting, and bad seed.

In the main, the crops have been good and free from disease.

The inspection, however, having shown that there is lacking a knowledge of the practical conditions of successful potato culture, on the part of some settlers who are utilising their land for this crop, the most recent facts and opinions bearing upon the subject have been collected, and are here

presented, in a form as simple as possible, without technicalities, and suitable for the conditions existing in the agricultural districts of Western Australia:—

General Principles—Soil and Cultivation.

It is everywhere admitted that the potato is one of the most useful and valuable crops which can be cultivated. As it is less exhaustive of plant food constituents, per unit of money value, than most crops, it should repay careful and efficient methods of culture.

It is a sub-tropical plant, and will endure considerable heat if, at the same time, it can enjoy light, air, and reasonable moisture.

The South-West district of Western Australia should be a good producing ground.

It will not bear frost, and if cultivated in wet soil will neither resist disease nor provide a crop of good quality.

Potatoes flourish best on deep, warm soils, rather rich without being rank; but, by manuring, the poorest and wildest sandy soils and the heaviest clays have been made to grow them successfully.

The choicest potatoes are raised on red, sandy soil. In Great Britain, for instance, the red lands of Forfarshire are famous for the high qualities of the potatoes grown upon them, and such potatoes will fetch twice the price of those grown on the black soils of the fenlands. They are much sought after for seed as well.

Most of the light, mixed, gravelly loams, yield high-class tubers, and though the rich, black soils may grow heavy crops, the quality can never be relied on, and success will be dependent upon favourable weather.

To be well suited to potato growing, a soil should possess, as essential conditions, an open situation, good drainage, freedom from acidity, absence of weeds, and natural or artificial richness.

The cultivation must be deep and thorough, and perfect tilths at the time of seeding, are desirable.

The tuber—an enlarged underground stem, and store-house of bulky material—wants room to grow, and needs soil of general and deep porosity.

In warm climates, and especially in sandy districts, the roots and underground stems of plants tend to avoid the upper strata of the soil, and form at much lower depths than in cool climates.

In Western Australia, deeper tillage than is usual in temperate climates is required.

Nothing can be worse than the dense, wet, weedy, surface-scratched, sand soils, in which some people expect potatoes to grow in this State.

Many virgin soils, according to chemical analysis, are rich in plant food, but no matter how fully and cheaply the soil may be supplied with nitrogen, nitrogenous compounds, and other food constituents, if, by lack of thorough tillage and care a comfortable home for the plant is not provided, nor are the full resources of the soil made available.

With such a crop as potatoes in a warm climate and in soil such as exists in this State, preliminary deep cultivation and subsequent thorough and frequent tillage are essentials to success.

Without these, as there may be considerable periods in which there is not enough moisture present to transport the plant food into the plants, little benefit may be expected from the real or potential nourishment carried by the land.

Plants suffer oftener from lack of moisture than from lack of food.

The land should be ploughed up in autumn, and left rough. In spring, the land should be re-ploughed and well tilled. If this be done two or three weeks before the crop is to be planted, it is of most advantage, aiding in the development of nitrates, the killing of weeds, and the storing, in the upper layers of the soil, of the reserves of moisture from the rains.

At no other time, moreover, can the advantages of tillage be secured so rapidly and cheaply.

The more a preparatory tillage can be given to potato ground, the quicker and more abundant will be the yield. After planting, also, the more frequent the intertillage, the better are the results.

This benefits potatoes more than most plants, since the earth-mulch, in addition to its effects upon underground moisture, and the utilisation of plant food, serves to keep the soil cool—a condition which is highly beneficial to the crop.

These are what may be termed the natural principles of cultivation. The appreciation of them gives to the farmer the choice between utilising the normal plant food and moisture already in the soil, or securing the one by purchase and the other by expensive irrigation.

With the winter and spring rains which prevail in Western Australia the need to irrigate this crop should never exist.

Manures.

Potatoes require potash, phosphoric acid, and nitrogen for the formation of perfect tissue. Farm manure, supplemented with superphosphate (or bone meal), sulphate of ammonia, and sulphate of potash has been found to give the best results. The proportions, amount, methods, and times of application vary with the character of the soil and climate, and these variations can be effectively determined only by experience. Where there is a normal quantity of lime in the soil, the superphosphate should be used in combination with the rest of these substances. If lime be seriously lacking, bone meal should replace or be used in addition to the superphosphate.

The composition of a complete fertiliser, which may be commended for general use in this State, is as follows:—

Superphosphate	5 parts
Sulphate of ammonia	1 part
Sulphate of potash	2 parts

It is better and cheaper to buy these materials separately, and mix them as required.

Sulphate of potash, though more costly than kainit or chloride of potash, is in every way preferable for the soils of Western Australia, in which, in many instances, a too great proportion of chlorides already exists. Chlorides also seriously waste the lime constituents of the soil. Further-

more, as they exist mainly as chloride of soda (common salt), the use of soda-base fertilisers is to be avoided, the more so in the case of potatoes, as this crop does not utilise soda.

The sulphate of potash also improves the quality of the crop, giving drier, cleaner, and better sized tubers. The best average results are obtained from a plentiful dressing of well-rotted farm manure, thoroughly worked into the soil in the spring a short time before the planting season, followed by an application of the complete fertiliser—four to eight hundredweight per acre—to the prepared furrows.

Seed.

Selection.—There should be no half-measures in selecting "seed" potatoes. The best, without taint of disease, should alone be used. In general, the whole tubers are preferable to cut seed. Medium-sized tubers fully as large as a hen's egg, give the best results. Small tubers produce weak plants, and should never be used.

Storage and Preservation.—"Seed" potatoes should be stored in a cool, light, and frost-proof place. If it is possible to accommodate them in single layers, so much the better. Nests of trays, portable frames, or shelves, can easily be arranged, on which the potatoes, whenever necessary, can be examined and moved easily and safely. Moreover, as such trays can be arranged one above the other to almost any height, a large quantity of "seed" can be perfectly stored by such means in a comparatively small space.

If there be any sign or suspicion of disease, the tubers showing it should be separated from the healthy ones, and, if considered worth saving, dusted with sulphur, and kept under observation.

Various chemical methods have been suggested for preserving "seed"—such as storing in lime, and treating with disinfectants—but they are not desirable. Lime increases "scab" disease, and disinfection interferes with the germinating powers of the tubers. Ripe "seed," free from wet, wounds, bruises, and signs of disease, especially if saved or procured from a healthy crop, can be preserved safely under the conditions of health provided by fresh air, light, and protection against damp and frost.

Preparation of "Sets" for Planting.—The methods of storage just indicated help, in the most effective way, to prepare the "sets" for planting.

If the "seed" potatoes have been stored so that they are each on end, the apex of the tuber uppermost, gradually, during the winter, germination will take place. Varieties differ in the period of their germination, some requiring as little as two months, whilst others do not show signs of growth for five or six months. On this account it is desirable to store the several (early, middle, and late) sorts quite distinctly, in positions which will admit of normal development at the proper germinating periods.

As tubers do not bear roots, it must be kept in mind that every growth issuing from the tuber is a potential tuber bearing stem, of which it is desirable to cultivate the most vigorous only. Rarely do two buds on the same tuber develop equally strongly. The central buds in the "eyes" near the apex are the most vigorous. The buds at the base are the weakest,

often remaining, and desirably being kept, dormant. The main shoots of the apex buds, in particular, should be cared for, and, as far as possible, germination should be limited to the two or three buds there.

The question of the advantage of cutting large tubers for sets is a debatable one ; but if cut tubers be used, they should be cut so that each piece contains buds which arise from the apex "eyes." These alone will produce vigorous plants.

The practice of germinating "sets" before planting secures, at each awakening "eye," the growth of a short, thick piece of stem with many *nodes* (stem joints), at each of which the *rhizomes* (branching stems), which bear the tubers, are produced. The yield is thus influenced to a considerable extent, for if the tubers are allowed to start growth in the dark, either indoors (as was the old practice) or below ground—seed stored in pits or planted before germinating—the shoots have fewer joints for the production of the tuber bearing *rhizomes* underground, and the leafy shoots sent above the ground are weak, the result being shown in a weakly plant incapable of feeding even the few tubers it will bear. However, once these favourable conditions of many tuber-bearing branches have been obtained, it must then be remembered that the tubers themselves will only grow in the dark. Hence is seen the value of effective "earthing-up" tillage after planting.

Methods of Planting.—The ground being ready and the furrows opened, the prepared "sets" are carefully removed and planted without injuring the shoots. The ridges are then split and the "sets" covered. It is assumed that the ridge and furrow system will be adopted. If the soil under cultivation be stiff and damp, the furrows should be run north and south. On lighter and drier lands they should run east and west, provided, always, that due consideration be given to the lie of the land for drainage.

Potatoes are commonly planted too closely. When no intercropping system is used, the rows of the earlier sorts should be not less than 21in., the second early and medium-sized growers 2ft., and the strong-growing main crop varieties 2½ft. apart. Each "set" should be at a distance of from 15in. to 18in. apart in the rows. For very early kinds, which are lifted before they are ripe, a closer arrangement is sometimes adopted, but for full ripe crops these distances are desirable.

Overcrowding leads to poor crops, and tends to foster disease ; the leaves do not get enough light and air to enable them to feed the tubers, whilst they usually overspread sufficiently to prevent effective intertillage and the application of preventive and remedial measures when such are needed.

An illustration showing the effects of these methods of selecting, preserving, preparing, and planting—and of the want of them—is here given.

The time of planting, and the selection of varieties to plant are matters of importance. The time of planting, again, depends largely on experience, and the different conditions of soil and climate. Experiments carried out on the Government Farm at Hamel provide information of value on both these points, and especially serve to emphasise the value of late planting in such conditions as are present in the State. The results as affected by the times of planting, show that, in the case of the plantings made from May to August, the yields, when not wholly failures, were invariably poor, and the quality bad. From the plantings set during the period from September

to February, both yield and quality were good. The following tabulation of results from a series of experiments with a number of varieties

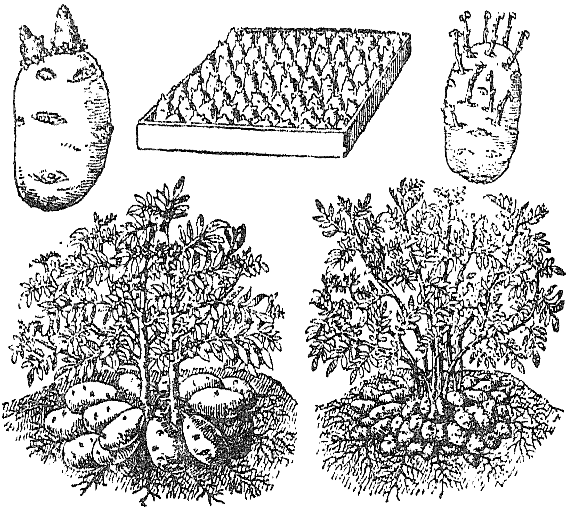


FIG. 1.—Seed potatoes and Resulting Crops. Prepared "set" (as in tray) and its crop on the left; weakened "set" and its crop on the right.

planted late, gives information which will enable the grower to judge of the value of the period of planting, and of the suitability of some of the varieties named for cultivation under particular conditions.

Potatoes planted, from November onwards, in well tilled soil, of medium quality and fairly moist. Complete fertiliser 8cwt. to the acre was used.*

Variety.	Northern Star.	Factor.	Freeman.	Edward VII.	Evergood.	Sutton.	Up-to-date.	Duchess of Norfolk.	Pink Blossom.	Queen of the Veldt.	Dalmeny Radium.	Vermont Gold Coin.	Noroton Beauty.	Eldorado.
Yield in tons per acre	9	25	8½	8½	11	6½	10	5¼	10½	5¼	7¾	4	3	1

Of these "Noroton Beauty" is a very early; "Duchess of Norfolk," "Dalmeny Radium," and "Vermont Gold Coin" are 2nd early; and the rest are main-crop sorts. The remarkable crop produced by the "Factor"—which corresponds to the yearly good results obtained from this variety in Great Britain, since its introduction there in 1900—indicates that it is a desirable potato for use in Western Australia. It has, at present, everything to recommend it, being a clean, well-shaped, firm, dry, prolific, and disease-resisting variety, and it grows well with comparatively little fertiliser. The "Up-to-date" sort does well on *poor soil,* and is the best kind to grow

* The complete fertiliser used in these experiments is composed of superphosphate, 4 parts; sulphate of ammonia, 1 part; sulphate of potash, 1 part.

under such conditions. On rich soil it often fails, and the tubers become large and unshapely, without being of good quality.

The minimum temperature for the germination of tubers is about 45° F. Tubers planted very early make little or no growth if set without the preparation already advised, and, even after the adoption of that plan, will suffer check in their growth and in their subsequent yield and quality. On this account, and because of the risk of excessive wet, the necessity of late planting cannot be too much insisted on.

Yet, even beginning with an October planting, there ought to be little difficulty in getting good crops of early varieties, as, under favourable conditions, the growth will be rapid. There should be nothing to hinder the production of two crops of potatoes on the same piece of land. The two-crop method is simply carried out, and is a profitable undertaking. The ground and "sets" being prepared as before described, and a little more liberal allowance of fertiliser used, some reliable *early* potato is chosen and planted. This early crop should be fit to lift in six weeks, and could be marketed as "new" potatoes at high prices. The ground, after being cleared of tops, is again worked through with the double board plough, the ridges being kept in exactly the same position they occupied over the first crop. A further slight dressing of fertiliser can be scattered in the furrows, or the "sets" can be planted without further manuring, the ridges split to cover the "sets," and the usual tillage methods followed. The second main crop will be grown practically on fresh soil, and the crop will be yielded almost as quickly as under the conditions of single cropping.

Varieties.—The following varieties are well-tested growers, and give good yields, of high quality, and disease-resisting powers:—

Early Varieties.—Beauty of Hebron, Duke of York, Myatt's Ash Leaf, Snowdrop.

Mid-season Varieties.—British Queen, Royal Kidney, Windsor Castle, Abundance.

Main Crop Varieties.—Factor, Evergood, King Edward VII., Northern Star, Sutton's Discovery, Up-to-Date.

Failures and Diseases of Crops.

There is scarcely room for failures and diseases if the methods herein described are reasonably applied.

Health is cleanliness, means and opportunity of right living in every phase of being; yet, at times, crops are indirect sufferers, even against all precautions.

The effects of the uncontrollable weather, some overlooked act, or neglect may arise in baneful results, which have then to be fought as one fights ills of all kinds.

Crops must suffer or fail if planted on crude land, undrained and untilled; and they will fail on land which may be well drained, well tilled and cared for, if too persistent cropping be practised. The best land, sooner or later, will become exhausted of some of the plant food constituents, unless it be given rest and change, or the change which is often rest and nutrition in one. The potato is a crop which the land will bear with almost longer than anything else, year after year. But both the crop and the land will suffer. The crop weakens, and fails to resist diseases and

pests, whilst the land absorbs much money and labour before it renews its fertility for a fresh crop.

The cultivator should see that a rational rotation is practised, however small his holding. If disease appears, this is the only way successfully to destroy it. Even the worst diseases which affect the potato family can be killed out by a three rotation system.

The smallest holding would be helped and safeguarded by a three-section cultivation: say, potatoes on one portion, cabbage on another, and a cereal (if only to feed the horse) on the remaining section; shifting these in rotation yearly.

Second Growth.—This defect causes waste, and should be avoided. When long continued dry weather, or absence of moisture through faulty tillage, checks vegetation, and is followed by rains, the partially ripened tubers, instead of increasing regularly in thickness when active growth again begins, grow out from the ends, or about the lateral "eyes." The new growth may form irregular lumps, or even smaller tubers on the older ones. This is "second growth." The remedy lies in proper tillage.

Diseases.

Potato Blight, known as *the Potato Disease.*—The first sign of the disease is the presence of yellowish spots on the leaves; the spots increase in size and become brown; this is followed by curling of the leaves. If the under surface of a diseased leaf is examined with a magnifying glass, the fruiting branches of the *fungus* will be seen forming a delicate white "mould." The "spores" of the *fungus* are very minute, and are scattered by wind, rain, and the movements of animals. Every "spore" brought into contact with a damp potato leaf is capable of starting a new centre of infection. The disease spreads rapidly, especially under conditions of damp and warmth combined. "Spores" that fall to the ground are washed by rain through the soil and infect the young tubers. The *mycelium* or *spawn* (vegetative portion) of the *fungus* also passes down diseased stems into the young tubers. If the season is wet and warm, the *mycelium* continues to grow, causing brown spots to appear, ending in rotting of the tubers.

Prevention and Treatment.—The disease is propagated and carried on from season to season in the seed potatoes. "Seed" from diseased crops should not be saved. Diseased haulms and tubers should be burned on the ground without removal. Varieties long in continuous cultivation easily contract disease. Frequent change of "seed" should be secured. Rows of growing potatoes should be well earthed up to protect the tubers from infection by "spores." The season, wet or dry, should be ignored, and systematic spraying with "Bordeaux" mixture practised, especially for the main crop varieties. (*See* illustration, Fig. 2.)

Black Leg, or Potato Stem Rot.—This is a very destructive disease. The leaves wilt and turn yellow; they then become shrivelled from below upwards, and finally die. The stems become black and rotten throughout. The disease is caused, primarily, by a *bacterium*, but as decay proceeds various kinds of *fungi* assist in the completion of the work. This disease also spreads with greatest rapidity in warm, moist conditions.

The death of the haulm at any early period, especially in the case of the late varieties, means almost total loss, as the tubers become infected by the *bacteria* that pass into the soil from the rotten haulm.

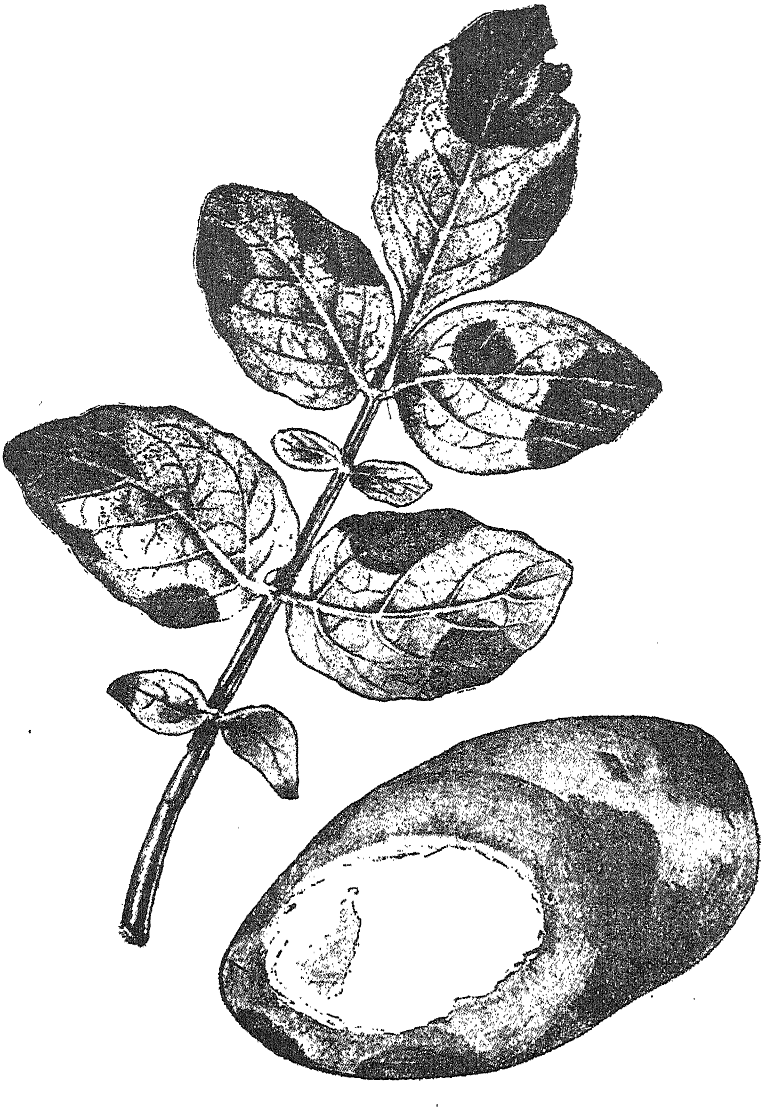


FIG. 2.—Potato Blight (*Phytophthora infestans*). Diseased leaf and tuber of potato.

Prevention and Treatment.—All root crops, as well as potatoes, are liable to this disease, and should not be cultivated for two years on land where disease has occurred. All infected plants and tubers should be burned. Cereals are not affected, and they should be used as rotation crops. Whole "sets" should be planted, and new "seed" used. Lime and strong nitrogenous manures should be avoided; spraying with "Bordeaux" mixture is of benefit. (*See* illustration, Fig. 3.)

Tuber Diseases.

Wet Rot.—In damp, warm seasons, the tubers underground may suffer from this malady, which also affects potatoes stored in pits or sheds in which dark, damp, and warm conditions prevail. The disease begins with the formation of dark patches beneath the skin of the potato, and the whole interior soon becomes affected by a brown, slimy "wet rot." It is difficult to detect this disease without cutting open the tuber, but the evidence of disease, in the interior, cannot be mistaken. "Seed" derived from crops known to have suffered from "wet rot" should not be used. The disease, of which there are several forms, is of *bacterial* origin. It is increased, subsequently, by the attacks of various *fungi* upon the weakened tissue. Suspected tubers should be soaked in a weak solution of "Bordeaux" mixture for an hour, then well dried, dusted with sulphur, and stored in the approved manner already described. "Seed" showing disease should be destroyed. (Figs. 4 and 5.)

Fig. 4.

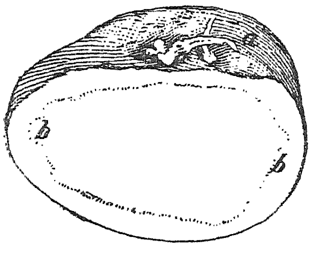


Fig. 5.

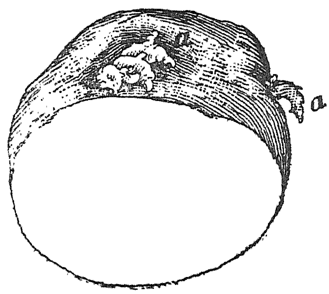


Fig. 4.—The sprouting of a potato suffering from the initial stages of "wet rot."
a, sprouts; *bb*, indications of the "wet rot.
The sprouts are weak and spindling. Compare with the adjacent illustration.

Fig. 5.—The sprouting of a healthy potato. To be compared with Fig. 4
aa, Sprouts.

Dry Rot.—There are also several forms of this disease, but the most prevalent is one which attacks stored potatoes. It is due to a *fungus*, which is seen on the outside of the diseased tubers, in the form of small white spots of "*mould*." It most readily attacks bruised or wounded tubers. The tubers shrink, the skin becomes wrinkled, and the contents are changed into a more or less hard, grey, crumbling mass, rather resembling dry, gritty chalk. Diseased tubers should be taken out of the store, and destroyed by

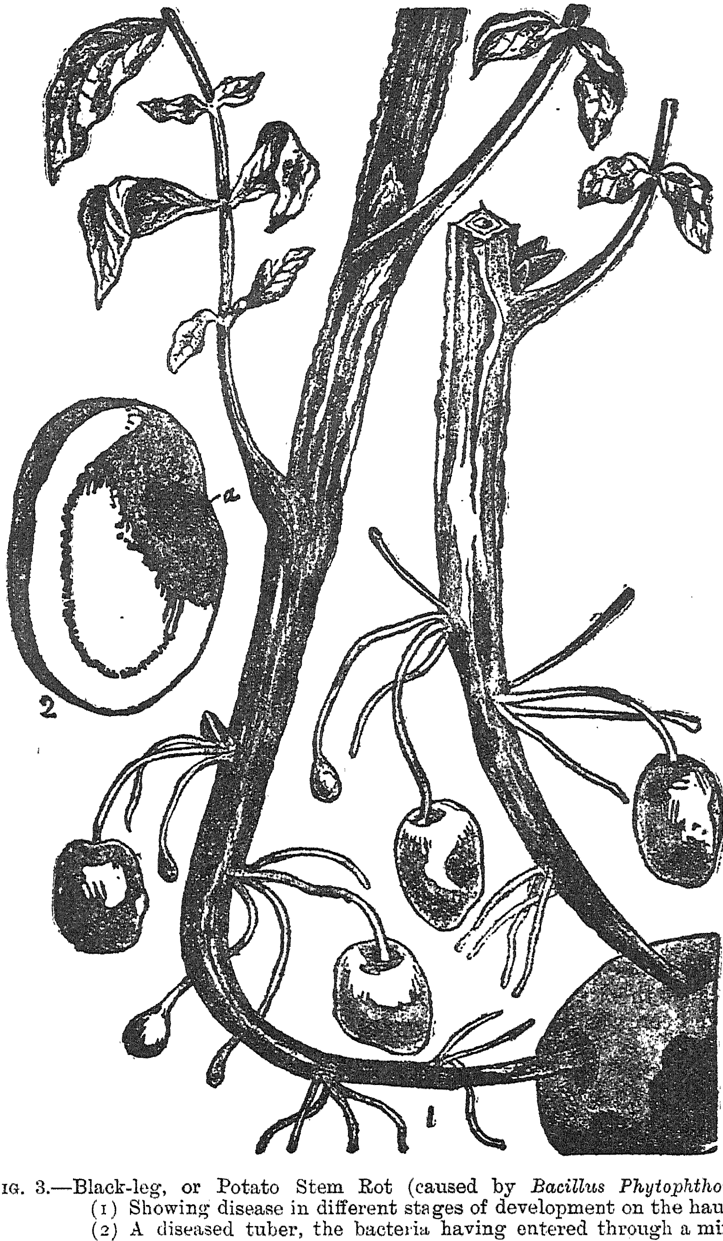


FIG. 3.—Black-leg, or Potato Stem Rot (caused by *Bacillus Phytophthorus*).
(1) Showing disease in different stages of development on the haulm.
(2) A diseased tuber, the bacteria having entered through a minute wound at *a*.

burning. The preventive and remedial measures recommended for the treatment of "Wet Rot" may be used to combat the "Dry Rot.

Scab.—This term is applied to various irregular forms of rusty, rough excrescences which form on the tubers. They are due to several forms of *fungi*, and are infectious.

Black Scab.—The tubers become infected, mainly through the "eyes," about which there is a formation of outgrowths having the appearance of warts and wrinkles. If infected at several points, the entire surface of the tuber may be covered with a rugged "black scab." The earliest symptom of the presence of "black scab," is the brown colour and wrinkled appearance of the very young shoots. If "seed" tubers are stored in the approved manner, they may always be detected, and necessary precautions taken to check the disease.

If sound potatoes are planted in infected soil, a similar condition occurs; the young sprouts become attacked, and converted into rugged masses which check all growth. The *fungus* survives in the soil for about two years. Rotation, therefore, must be practised. Most root crops, especially the *beet* family, are attacked, but cereals are exempt.

"Seed" should be treated with sulphur, after being thoroughly dried, and stored under healthy conditions. All diseased potatoes should be burned. Even if fed to pigs—unless the tubers are previously boiled—the "spores" will certainly be returned to the land. (*See* illustration, Fig. 6.)

Common Scab.—This *fungus* usually attacks the tubers while young; the patches of disease increase in size and number, and, not infrequently, when the tuber is full grown its surface is, more or less, completely covered with "scab." The injury is confined to the surface of the tuber, and the quality of the potato is not seriously impaired for eating. The market value, however, is much lowered. Scabbed potatoes should not be used for "seed,"

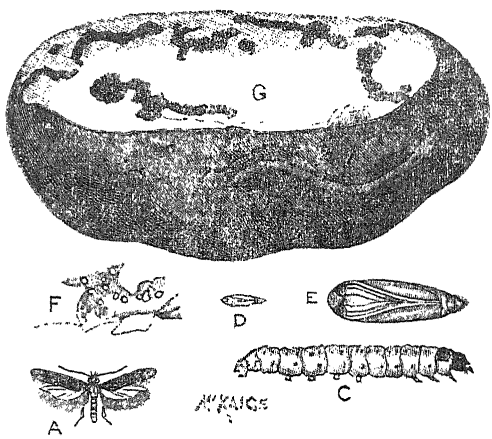


FIG. 7.—Common Potato Scab (*Oospora scabies*).

unless they are sterilised, or the disease will pass into the soil, and be difficult to destroy. Before planting, the "seed" should be immersed in a weak "Bordeaux" mixture, or a Formaldehyde solution (1 in 300) for an hour, spread out until quite dry, and then planted. The sulphur treatment

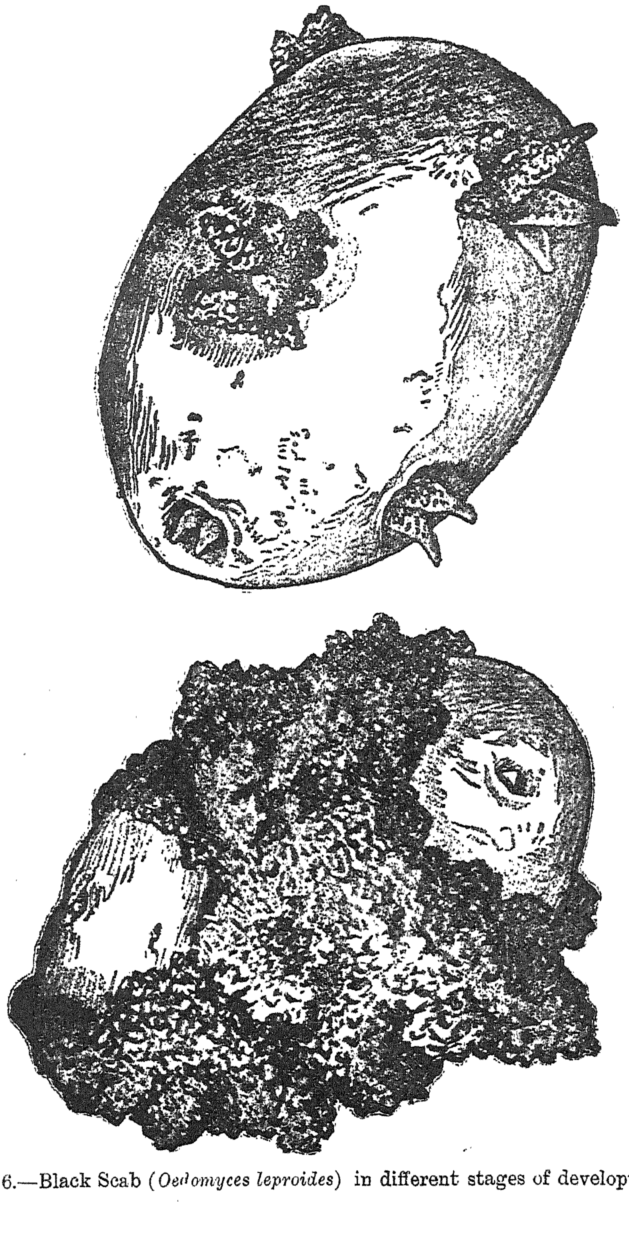


FIG. 6.—Black Scab (*Oedomyces leproides*) in different stages of development.

should be applied to "seed" before storing. Lime and strong nitrogenous manures must be avoided.

Peelings of and badly infested tubers should be boiled before being fed to pigs. Preferably, however, all diseased matter should be burned. (*See* illustration, Fig. 7.)

Potato Moth.—This is a pest which appears to be indigenous to Australia. It is said to be found all round the coastal areas. It, however, is not likely seriously to affect healthy growing crops, but must be looked for under other conditions of disease, and unfavourable weather, when the growth of the plant is checked or weakened. Insect pests are much less to be dreaded than the almost unseen fungoid and bacterial enemies. Against the former Nature provides natural enemies—birds, toads, frogs, and other insect-eating creatures, and, usually, Nature keeps the balance reasonably

FIG 8.—Potato Moth (*Lita Solanella*).

well. General healthy conditions, and the protective and remedial measures which secure plants against the attacks of fungi and bacteria, do so to a greater degree against the raids of insect life. The treatment of seed and the spraying (*see* special formula, p. 427) of the growing crops provide the necessary security. (Fig. 8.)

General Treatment.—No crop so well repays the help of spraying as the potato. A neglect of this precaution causes much loss. Main crop and late varieties should not be grown in doubtful soil and unfavourable localities, unless it be intended to protect them with "Bordeaux" mixture. Properly applied, "Bordeaux" mixture not only reduces risk of disease to a minimum, but preserves the vigour of the haulm and benefits the growth of the tubers to such an extent that a substantial increase of crop is secured.

The spraying should be begun before the attacks of the "spores" or "germs" can take place, that is, as soon as there is a fair development of haulm. It should be repeated about three weeks later, and, in some cases, a third application should be given after the lapse of another two or three weeks. The plants should be sprayed from beneath as well as from above, and the application will be most effective when applied as a fine spray rather than as a rain.*

"*Bordeaux*" *mixture* should be thoroughly well made of pure materials. The ordinary formula is well known, and need not be repeated here. Recommendation, however, is made of an improved and effective "Bordeaux" mixture, which has not only proved itself highly satisfactory, but has the advantage of being a solution, instead of containing a sediment, of the copper compound.

IMPROVED "BORDEAUX" MIXTURE.

Copper sulphate (bluestone)	1lb.
Lime (fresh and quick)	1lb.
Agricultural treacle	1lb.
Water	10 gallons.

Preparation.—Dissolve the "bluestone" in 10 gallons of (preferably) rain water, and boil the lime and the treacle together with a quart of water for half an hour. When the "bluestone" has all dissolved, and the lime and treacle liquid is fairly cool, pour the latter into the "bluestone" liquid, stir well, and it is ready for use. This mixture will keep for months if covered so that air is not allowed free access to the surface. A thin film of oil—kerosene—carefully floated on the surface of the liquid, will secure this. The kerosene can be skimmed off when the solution is required for use. Metallic vessels must not be used for mixing or storing the solution, which, also, is poisonous. In appearance, this differs from ordinary "Bordeaux" mixture in that, instead of being a mixture containing a blue sediment, it is a greenish coloured liquid containing a chemical compound of copper and treacle. When sprayed on a plant, the carbonic acid in the air rapidly turns the solution into a blue powder, which becomes firmly and intimately fixed to the surface of the foliage. The success attending the spraying of "Bordeaux" mixture, lies wholly in anticipating attacks of disease, and maintaining a protective coating so long as danger of infection lasts. It must, therefore, be used for what it is—the prevention, which is better than cure.

GENERAL WASH FOR ALL BITING AND SUCKING INSECTS.

Rain water	3 gallons, or 100 gallons.
(1.) Arsenate of Soda	$\frac{1}{4}$ oz. or 6 ozs.
(2.) Acetate of Lead	$\frac{3}{4}$ oz. or 18 ozs.
(3.) Paraffin Emulsion... ...	8 ozs. or $1\frac{1}{2}$ gallons.

* An effective spray nozzle, which delivers the liquid in the form of a fine mist, and from any position, is that known as the "Abol."

For making either 3 or 100 gallons, as may be needed, add the materials in the order named, with thorough stirring, and be sure that each salt is dissolved before the next is added. This will kill "Potato Moth," and all such things.

The Moral of all this is the old-fashioned proverbial one, "God helps those who help themselves."

Nature is a good mother to all her children, but she does not spoon-feed them. All forms of life may be held to have some useful function, and because at times certain forms are injurious to other forms, it must not be assumed that they are always so, or even usually so. It is in evidence that a virulent disease producing organism may be taken and used, in order to provide a means of resisting the very disease it causes.

Precautions are better than remedies, and good and intelligent work and management will always repay themselves. If one thing more than another wants preaching to the cultivators in a new country, it is the danger of inconsiderate and neglectful farming; the persistent cropping and careless cultivation, which end in fouling and starving the land and the tiller, and put off farther into the future the time of prosperity for the land which, in natural course, should not await even the third and fourth generation to establish it. After all, *success* resolves itself into its literal meaning—*that which goes after*, and this is as true of a single common thing like potato culture, as it is of the highest and most honourable act in life. For success now and to posterity, dependence must be on *good farming*, and all that it means—self reliance, toil, trouble, patience and the application of sense and knowledge; not on doles and remedies to remove the results of mischief done by ignorance, neglect, selfishness, or the often fictitious methods which strive to displace the balance of natural laws, in order to make good some other displacement which our own faults have created. Nature protests violently at times, and then the penalty falls on the good and evil alike. The moral may be added to by the adoption of another proverb—"make haste slowly!"

A NEW STOCK ROUTE.

INVESTIGATION TO BE MADE.

For some time past the Government has had under consideration the question of opening up a stock route, says the *Western Mail*, from East Kimberley to the Eastern goldfields, to allow cattle from the tick-infested areas to be brought down by such a route that there should be no chance of the pastoral areas lying to the west of the rabbit-proof fence being infected. It is the opinion of experts that tick will not live for any time in the dry tablelands of the interior, so that, by the construction of a more easterly stock route than any at present in use, the chance of tick being introduced into the North-West and goldfields districts is regarded by these authorities

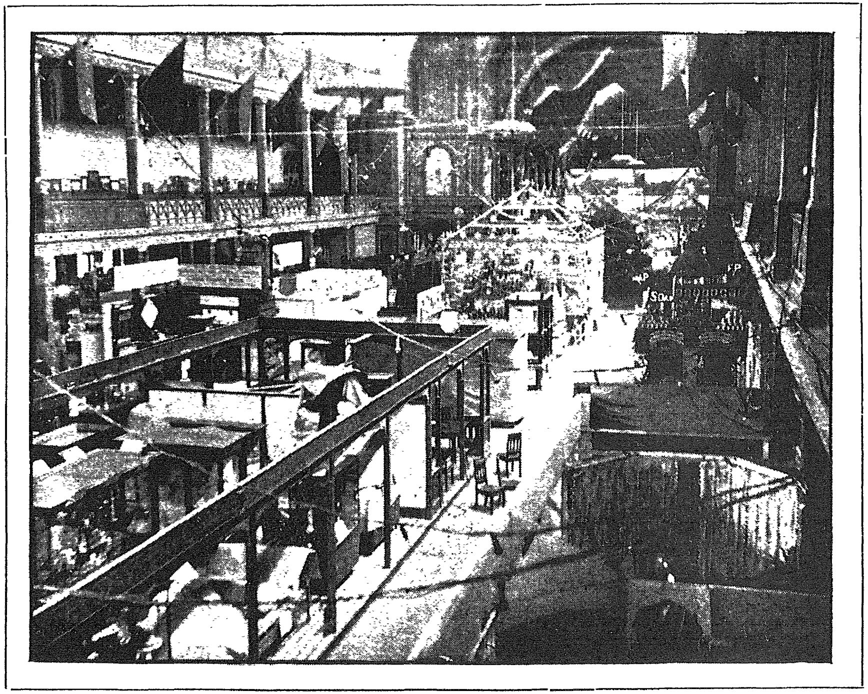


FIG. 3.—General view of Main Hall, Melbourne Exhibition.

as remote. It was recently decided by the Government to equip a strong party to make a preliminary examination of the proposed route, and the arrangements are now complete. The route that it is proposed to first examine starts from Wiluna (Lake Way), thence in a north-easterly direction to Separation Well, a distance of about 350 miles, and thence to the head of Sturt Creek, approximately about 350 miles further.

The country from Wiluna to Separation Well is not entirely unknown, it having been traversed by various explorers, notably by Sir John Forrest, who in 1874 discovered Weld Springs, and by Mr. L. A. Wells in 1896-7, and by various prospectors, but after leaving Separation Well it is practically unknown. D. W. Carnagie, in 1896-7, traversed the country about 100 miles to the east of the proposed route of the present expedition, taking a northerly course, and Warburton, in 1873, taking an easterly course, passed about 75 miles to the south-west of the head of Sturt's Creek. It is, however, generally supposed to be an extremely arid tract of country, with practically no surface water, although it is thought that water may be obtained by sinking at a shallow depth.

The Minister for Mines (Mr. H. Gregory) has always advocated the examination of this country, and the opening up of this stock route, and the details of the expedition have been arranged by the Mines Water Supply Branch of the Mines Department, under his direction.

Mr. A. W. Canning, an inspecting surveyor of the Lands Department, has been appointed leader of the expedition, for which post he is considered particularly fitted by training and experience. Before coming to Western Australia, some 13 years ago, he had considerable back-country experience in New South Wales, and since coming to the West he has been engaged on many important surveys for the Lands Department. To him was entrusted the direction of the rabbbit-proof fence survey, from the South coast to Wolall, on the North-West coast, between Port Hedland and Broome. Mr. Canning carried out this work to the entire satisfaction of the Government, the northern portion of it under exceptionally trying conditions. The experience gained while on this survey should prove exceptionally valuable to him on the work he is about to undertake.

The party will consist of seven men, picked for their special bush experience in Western Australia, and among them is an experienced boring foreman. A boring plant, capable of boring to a depth of 100 feet, will form part of the equipment, and every opportunity will be taken of testing the country to be traversed for water. Camels (22 in number) have been assembled at Day Dawn, whence the party will leave in a few days. On reaching Sturt's Creek Mr. Canning will return to Lake Way.

CHAPMAN EXPERIMENTAL FARM.

REPORT FOR APRIL.

By R. C. Baird.

April has proved excessively dry, no rain having fallen during the month. As we have reached the end of the summer, the pastures are very bare, and the stock are falling off in condition. No improvement in the condition of the pastures can be expected until the rains come.

The supply of rain water used for drinking purposes having given out, we are carting water from a well on No. 5 paddock, distant about one mile. The carting of water at this time of year is a tax on our available horse flesh, and I think it would be a great saving to put down a large underground tank.

The blocks of land lately secured for addition to this farm are situated about five miles from here. Some little time ago bush fires swept over the land, and left little or no feed. These blocks will have to be fenced in the immediate future, and when some ring-barking has been done on them, they will be most useful to us for running stock.

Ploughing for the general crop has been carried on during the month, and we have now over 200 acres ready for sowing. Some of the fields were very hard, and as the weather has been fairly hot, the work has been very trying on the horses.

A fair number of orders for seed wheat have been received. As we are cropping a larger area this season, and will require more seed than formerly, there will not be as much to dispose of.

The dairy cattle, owing to the shortage of feed in the paddocks, are now getting two feeds daily. The stack ensilage—which is now getting low—has been most useful. The cows, on two feeds a day, have given a fair quantity of milk and maintained their condition.

The pigs are in good healthy condition, being fed principally on melons. The melons are boiled with some wheat-seconds, and fed to the pigs twice a day. They also get a feed of raw melons once a day. The raw melon is an excellent substitute for green fodder.

The sheep are in fair condition considering that we are pretty heavily stocked. Lambing has not commenced yet and I should like to see some good rains before any are dropped.

The pure Shrops are in excellent condition. This breed appears to do well here. We have several very good young rams which will be for disposal later on.

Sowing operations will be commenced in a few days and will be continued until the ploughs are caught up.

AFFILIATION OF AGRICULTURAL SOCIETIES.

A CONFERENCE OF DELEGATES—FOUNDATION OF SCHEME ADOPTED.

At the conclusion of the special general meeting of the Royal Agricultural Society on the 17th instant, delegates who were present from some of the principal agricultural societies of the State met in conference to discuss the question of affiliation. Mr. G. P. Patterson presided, and the delegates in attendance were Mr. Jas. Mitchell (Northam), Mr. Marwick (York), Mr. W. S. Hales (Wellington), Mr. Williams (Nelson), Mr. Uren (Narrogin), Mr. Morgans (Jandakot), Mr. Gale (Southern Districts Agricultural Society), Mr. Parke (South-West Central Agricultural Society), Mr. D. Patterson (Murray), Mr. J. J. Treasure (Kojonup), Mr. J. Wilkie (Williams), Mr. Wm. Padbury (Swan), Mr. Theo. R. Lowe (Royal Agricultural Society).

Mr. Lowe explained that the York Agricultural Society recently issued a circular which his committee interpreted to mean that they desired affiliation. A resolution having also been recently passed by the Northam Agricultural Society in favour of affiliation, his committee decided to invite delegates from the various agricultural societies to attend a meeting, and thus afford the opportunity of discussing this important question. He wished particularly to point out, however, that his society, although pleased to do all they could to assist affiliation, did not wish in any way to force affiliation upon the societies. He had drawn up certain suggestions which were now submitted to the conference. These suggestions were expressive of the opinion given by his society on former occasion.

The Chairman said he was pleased to see so many delegates present, for it showed a desire on the part of the various societies to affiliate. He presumed that the delegates had all come prepared to express an opinion, and that certain resolutions would be forthcoming.

Mr. Hales said he thought it would be well, first of all, to hear the opinions of the delegates as to the powers they had received from their societies. The Wellington Agricultural Society, which he represented, was in favour of affiliation.

Mr. Lowe said he would like to state that he had received a letter from the Geraldton Agricultural Society in favour of affiliation. He was sorry Mr. Davis was not present, and he had also expected to see Mr. Wilding from Northam. The only letter he had received antagonistic to affiliation was from Katanning (Great Southern Pastoral and Agricultural Society).

Mr. Morgans asked whether the affiliated societies would have annual meetings or half-yearly ones, or would arrangements be left altogether to the Royal Agricultural Society?

Mr. Lowe stated that what they wanted at present was to discuss the lines upon which the societies would be willing to affiliate. He did not want them to consider the Royal Agricultural Society at all. If his society did not desire to affiliate they would say so.

Mr. Morgans said so far as he could make out there was a certain parochial feeling that the Royal Agricultural Society was trying to get affiliation with a grab-all object. This, however, was not his opinion. The societies desired to affiliate in order to prevent the clashing of show dates. There were too many shows at present, and it would be well if the delegates could meet and curtail the number of little shows. At present the societies seemed to be afraid of one another. If delegates from the different societies could be brought together half-yearly it would be of great advantage. At the present time Government grants were given on the basis of 10s. in the pound. He feared they could not do much better than that. If the delegates would meet and consolidate the shows, they might be able to get more money.

Mr. Uren said the Narrogin Society would be pleased to join. They wanted a guiding hand, and in this direction they looked to the Royal.

Mr. Gale said the Southern Districts Agricultural Society, which he represented, were in accord with the affiliation proposal. He did not, however, agree with the suggestion of Mr. Morgans to close up any of the shows.

Mr. Williams stated that his society held a meeting a fortnight ago, and he was instructed to attend and say that so far as the Nelson Society was concerned they wanted to affiliate, and had wanted to do so for several years, with the Royal Agricultural Society as the head. There were several subjects which they desired to see discussed, such as the clashing of show dates and obtaining of judges. If they had certain schemes laid down they would have better judging and better stock.

Mr. Douglas Paterson stated that this question was discussed by his society, who were in favour of affiliation, particularly in regard to the question of judges. It was very hard for a committee located so far from the big centre to get good judges. They would like to see the Royal Agricultural Society have the ruling hand in the matter. His society would like to have information as to the rules of the affiliated societies—would a society have any say in the case of appeal?

Mr. Lowe said he thought the meeting had taken the right turn. The delegates from the various centres having now expressed the wishes of their societies, some proposals should be put before the meeting. Some societies wished the Royal to be the governing body, whilst others would like to see the governing done by an elective body. It was now for the meeting to decide these questions, and the various points having been decided upon should then be submitted to the societies.

Mr. Parke stated that his society were in accord with affiliation, and had sent him as a delegate to ascertain the views of the Royal Society, and had given him full power so long as there was nothing to interfere with the self-government of his society.

For the information of the meeting Mr. Lowe read the following resolution passed by the Northam Agricultural Society, which had been forwarded to his committee:—

"That the time has arrived when, for the purpose of better control, the chief agricultural societies of the State should affiliate with the Royal as governing body."

Mr. Hales said the Wellington Agricultural Society were in favour of affiliating on similar lines to the arrangement which existed between the

different race clubs of the State and the W.A. Turf Club. He would move—"That the time has now arrived for affiliation, for the purpose of better control, with the Royal Agricultural Society as the chief governing body."

Mr. R. C. Williams seconded the motion.

Mr. Parke said this appeared to cover too much ground for one motion. The better plan would be, first of all, to affirm the principle of affiliation.

Mr. Morgans moved as an amendment that the last clause of the motion—"as chief governing body"—be omitted. If the societies did not have a voice through their delegates they would not join. Some of them were too suspicious.

Mr. Uren stated that on behalf of the Narrogin Society he was prepared to state that they wanted a governing body. They looked upon the Royal as a body to which they could refer disputes.

Mr. Gale said he did not think it was the desire of the Royal to "run the whole show."

Mr. Lowe said they had quite enough to do to run their own.

Mr. Wilkie (Williams) said he had been appointed a delegate to represent his society. He thought the amendment was the best course to adopt. He had received no resolution from his society, but he was in favour of the amendment.

Mr. Lowe said he had received a telegram from Williams agreeing to affiliate.

Mr. Padbury said he had been appointed to represent Swan Agricultural and Horticultural Society. It was the wish of his society to hear the discussion, but they were not at present prepared to say what they would do. It was, in his opinion, a good thing to have a meeting of delegates once or twice a year to discuss matters generally. He thought it would be well to affiliate with the Royal, the parent society of the State, to which they could look for instruction in time to come. He was pleased the matter had been brought forward, and hoped the result would be good.

Mr. Hales, with the consent of his seconder, amended his motion to read:—"That the time has arrived when, for the purpose of better control, the chief agricultural societies of the State should affiliate with the Royal.

The motion was then put to the meeting and carried unanimously.

Mr. Parke moved, and Mr. Padbury seconded, the adoption of the following objects of affiliation:—

1. To prevent the clashing of show dates.
2. Concerted action in approaching the Government on questions of general interest to affiliated societies.
3. For the better classification of stock so as to prevent the offering of prizes for crossbred sires.
4. To adopt the rules and regulations of the Royal Agricultural Society as far as practicable.
5. To assist affiliated Societies in any possible way.
6. To uphold any disqualification made by the affiliated societies.
7. The improve the present systems of appointment of judges.

The motion was carried.

Mr. Lowe pointed out that in the action which the meeting was now taking no delegate was committing his society. The whole thing when boiled down would have to be submitted for approval in a condensed form. If they agreed with it, then it was for them to say that they would take concerted action. If, however, they could not agree in regard to detail, it meant that the whole thing would be thrown out. His society had done all they could towards affiliation, and it was now for the other societies to say on what basis they wanted affiliation.

Mr. Parke said the standard of judging would be very much raised by taking action in regard to the appointment of judges. They had had some very absurd judging at times.

Mr. Mitchell stated that the delegates having now agreed to affiliate, the better plan would be to ask the Royal Agricultural Society to become the governing body, and to draw up and submit a scheme.

Mr. Hales said there was no doubt the Royal Agricultural Society would give them a fair go and treat them properly. He would second the motion.

Messrs. Padbury and Parke spoke in support of the motion.

Mr. Morgans suggested that the motion should be so amended as to read—"with the Royal Agricultural Society as the governing body, and with an equal number of delegates from the affiliated societies."

Mr. Hales pointed out that trouble would be experienced in getting delegates together in Perth.

Mr. Morgans stated that one delegate could be sent to represent three or four different societies.

Mr. Lowe said he did not agree with Mr. Mitchell. There was a good gathering of delegates present, and they would probably never get such a number together again. He was not prepared to say that it should not be ultimately submitted to the Royal Society, but he would like to see the matter further discussed.

Mr. Mitchell said good work was never done at a meeting of this kind. It ought not to be done in a hurry.

Mr. Lowe: We have attacked the principle, but we have gone into none of the details. Nothing, for instance, has been said as to how we are going to prevent the clashing of shows. You have given us no guide. We want to draw up a scheme that will be acceptable. We can better do it if we have the views of the gentlemen representing the various societies.

Mr. Parke stated that in regard to the clashing of show dates the Royal Agricultural Society would make themselves acquainted with the present show dates of the different affiliated societies.

Mr. Mitchell said it seemed to him impossible to arrive at a decision at the present meeting. He was prepared to withdraw his resolution and bring it on at a later stage.

Mr. Lowe said that what was wanted at present were suggestions for the guidance of the Royal.

At this stage the chairman asked whether the meeting wished to consider *seriatim* the various suggestions on the notice paper. To this the meeting agreed.

No. 1.—Clashing of Show Dates.

Mr. Marwick suggested that the affiliated societies should apply to the ruling body for show dates on the same principle as racing clubs, whose dates were granted by the W.A.T.C. Applications should not be taken later than one month before the show. An early date suited some districts, whilst a later date suited others.

Mr. Mitchell stated that on the 1st January every society should be at liberty to apply for a date, and if the date asked for did not clash with any other show it should be granted.

No. 2.—Classification of Stock.

In regard to the classification of stock, Mr. Mitchell stated that if they took action to prevent the giving of prizes for anything but pure-bred stock they would shut out some of the big country societies. They should, however, encourage the breeding of pure stock. At the Royal show a prize was given to a horse that was not in the stud book. If a prize was given for a Shropshire ram, and he was pure, he should be in the stud book. He was strongly in favour of defending class. It should be made necessary to produce pedigree.

Mr. Marwick stated that if this was carried into effect it would upset all the country shows in the State. There were not ten breeders here who had registered stock in the stud book. One of the best stallions in the State—Royal Blue—was not registered because they could not find the pedigree.

Mr. Parke said the trouble with his society had been to find the proper definition of hack. People were using horses as hacks now that were racing a short time ago. It had led to some little feeling amongst members of his society. He would like to have a definition.

Mr. Lowe said the discussion had been made to hinge entirely round the particular question of thoroughbreds. As to the judging of thoroughbreds, a society might be wealthy enough to provide a separate class for those appearing in the stud book. He did not think they should take the risk of reducing the number of exhibits. They would be overstepping the mark if they reduced competition. They must first get competition, and, speaking generally, it was unwise to make restrictions until competition was keen. There was competition of a sort, but very little. The difficulty might be overcome by making a class for thoroughbreds appearing in the stud book, but instructions should be given to the judges that they could, and were expected to, call for pedigrees.

Mr. Mitchell said that, so far as he knew, a thoroughbred must be in the stud book. A person showing in a class advertised for thoroughbreds should only be allowed to show stock appearing in the stud book. If a person had a good racehorse which was not registered in the stud book the value of same would be discounted. No matter how well a crossbred might look, it would still be a crossbred. No argument against registration in the stud book would hold. They should give these prizes for horses that were registered.

Mr. Lowe said that he quite agreed that they should give the prizes to pure breds. The mere fact, however, of a horse's name being in the stud book did not make him any more thoroughbred than his full sister whose name was not registered. He maintained that pedigree as given in the entry forms took the place of the Australian Stud Book. He hoped the

meeting would not say that prizes should only be given to horses that appeared in a stud book.

Mr. Uren said that as a rule judges did not see the nomination forms. He thought they should call for them, as they were entitled to do.

Mr. Morgans stated that this would also apply to cattle, sheep, and pigs. In the old country it was necessary to enter in the stud book, but it was different here. There was only one stud book for the whole of Australia.

Mr. Padbury said he did not see why they should exclude stock because it was not entered in the stud book. By insisting upon this rule many people would be excluded altogether. It would shut out many good people, and would decrease the amount of stock shown.

Mr. Mitchell: There should be some definition. A thoroughbred horse is a horse entered in the stud book. You must have some definition. I move—That this meeting ask the Royal Agricultural Society to give an interpretation of the word thoroughbred as used in their schedule of prizes.

Mr. Padbury seconded the motion, which was carried.

Mr. Marwick said this should apply to all kinds of stock. He hoped nothing would be done to prevent the exhibiting of crossbreds.

Mr. Mitchell asked if it was open to the meeting to alter any of the objects already agreed to.

The Chairman said the matter could be put to the delegates present, and the alteration could be made if they were agreeable.

Mr. Mitchell suggested the following amendment:—"For the better classification of stock, so as to permit of having all prizes for the pure-bred sires."

Mr. Parke said it might interfere with the general purposes. In sheep cross-breds were the best commercially. They should keep in view the purity of blood in stock, but this clause about pure-bred stock did not appear good to him. He did not think it would do any good to agriculture, but it might do harm.

Mr. Gale: There is nothing said against offering prizes for crossbreds; but if the schedule says, for instance, "shorthorn" bull, it must be unmistakably a shorthorn bull.

Mr. Williams moved that clause B read—"For the better classification of schedule, so as to promote the offering of prizes for pure-bred stud stock." He moved this simply to test the feeling of the meeting.

The amendment was carried.

Governing Body.

In regard to the question of the appointing of a governing body, Mr. Lowe stated that the Royal Agricultural Society were prepared to help this matter along as far as possible. He could not, however, take the responsibility of saying exactly what they would do.

Mr. Morgans said he would prefer each society to send a delegate to form a council.

Mr. Parke: The formulation of this scheme seems to rest with the Royal. If that society does draw up a scheme it would not prevent them calling on the other societies to assist in the organisation. It was desirable that a resolution should be carried making the Royal Society the head.

Mr. Mitchell moved—"That this meeting ask the Royal Agricultural Society to become the governing body, and to draw up a scheme of affiliation to be submitted to the various societies for their approval or otherwise."

The motion was carried.

Nos. 4, 5, and 6 were agreed to without discussion.

No. 7.—Appointment of Judges.

Mr. Lowe stated that under this heading every society in the State had received a circular letter from the York Society suggesting the formation of a live stock judging association. This letter had something to do with the calling of the present meeting. His committee, reading between the lines, looked upon it as one more reason for affiliation. He had since had a personal interview with Mr. Moore, of York, who was the mover of the resolution, and that gentleman had slightly altered the matter contained in the letter, and which alteration had made the intentions of the York Society much plainer to the speaker. The Royal Agricultural Society interpreted the letter to mean that there should be a live stock judging association in conjunction with the societies. Mr. Moore had explained that this was not necessarily so. Mr. Moore had also written giving the following as the objects of such association:—

1. That an association be formed, entitled "The Live Stock Judging Association of Western Australia."
2. That the proposed association consist of a council and members.
3. That the objects of the proposed association be:—(*a.*) To look out for judges for live stock. (*b.*) To ascertain as much as possible about the experience, integrity, and judging capabilities of such men, and to watch the awards and methods of judges at agricultural shows. (*c.*) To issue certificates of competency. (*d.*) To publish a list of such certificated men. (*e.*) To arrange for instruction for amateurs in live stock judging by points. (*f.*) To promote judging competitions for amateurs at agricultural shows, and to hold an independent competition of this kind annually at stud farms or other places as may be arranged. (*g.*) To encourage judging by points. (*h.*) To compile and publish standard scales of points with a view to their adoption by the agricultural societies, subject to their willingness, so that all live stock may be judged on the same lines throughout the State. (*i.*) To hear and determine appeals against the decisions of judges. (*j.*) To correspond with leading breeders, societies, firms, and Government Live Stock Departments all over the world, and to compile and issue periodical circulars to members embodying any information of value thus obtained.

Mr. Marwick moved,—"That a Live Stock Judging Association be formed under the patronage of the Royal Agricultural Society." He said the York Society considered that the best course was to invite the co-operation of the other societies in this matter. They would never have proper judging until something of this kind was done. It was not quite clear to his mind how it was going to work, but with the assistance of the other societies it should be possible to make it workable.

Mr. Williams seconded the motion.

Mr. Mitchell said it was very desirable that they should get competent judges, but this matter should not form part of the affiliation scheme.

Mr. Williams moved as an amendment—"That this meeting is in accord with the formation of a Live Stock Judging Association."

Mr. Hales seconded the amendment.

It was ultimately decided to hold consideration of the matter in abeyance.

Mr. Morgans suggested that the Royal Society might keep a register of those whom it considered competent to judge.

Mr. Lowe said that his society, like all other societies, had great difficulty in obtaining the services of suitable judges. They had sent out to all their last year's exhibitors a circular letter, together with a list of provisional judges, requesting that the names of those not suitable be struck out, and the names of others inserted. A good many replies had been received. The appointment of their judges for this year would not be undertaken by his committee until they had finished with the schedule of prizes.

Mr. Parke stated that no difficulty was experienced in Victoria, but there they had so many competent men to select from.

Mr. Lowe: Last year we imported three judges who were a distinct success, and it cost us £40.

Mr. Marwick: It pays to import judges, especially for blood and draught stock. If the societies affiliate it may be advisable to pay judges to come over.

Mr. Uren said it would be well for the Royal Agricultural Society to communicate with the different societies and ask them to recommend suitable gentlemen in their districts who would be willing to judge in other parts of the State.

Mr. Marwick moved—"That it is desirable that a Live Stock Judging Association be formed outside the agricultural societies, in accordance with the circular letter from York and Mr. Moore's letter."

Mr. Hales seconded the motion.

Mr. Lowe said he would inform the secretary of the York Society.

Mr. Marwick said the next step they should take would be to approach the Government and request the formation of judging classes.

Mr. Mitchell said he did not think this scheme would be at all to their liking. The society which he represented would select their own judges. They would not be bound by an association. It was not a matter that should be considered at the present meeting, and so far as he was concerned he had no intention of voting.

Mr. Lowe suggested that Mr. Marwick should alter his motion to the effect—"That it was desirable that a Live Stock Judging Association should be formed outside the agricultural societies."

Mr. Marwick said they wanted some better method of judging, and it was a fair thing to have it discussed. He had refused to exhibit stock because of the incompetency of men appointed as judges. If they could bring out judges who were proved to be capable of judging it would be a good thing.

Mr. Parke said it appeared to him to be grotesque and absurd that a self-created body should take control of the appointment of judges.

Mr. Mitchell said he did not agree with the scheme, though a better system of judging was necessary. He moved as an amendment that the various societies represented be asked to take into consideration the importance of competent live stock judges being appointed, pointing out that the delegates did not agree with the proposition submitted by the York Society. Also, that the thanks of the meeting be accorded to the York Society for what they had done in the matter.

Mr. Parke seconded the motion, which was carried.

This concluded the business of the Conference. Votes of thanks were accorded to the Chairman, also to the Royal Agricultural Society, coupled with the name of the secretary (Mr. Lowe).—*W. A. Farmers' Gazette and Market Report.*

AGRICULTURAL SOCIETIES.

The Editor, Journal of Agriculture, Perth.

SIR,—In your issue for April, you ask why the Secretaries of Agricultural Societies do not write, and why agriculturists do not ask questions to be answered, and take more interest in the *Journal*. Well, for my part, I think the *Journal* a splendid publication, as good as, if not better, than any produced in the other States, and for instruction is probably not excelled anywhere. But that is not all the agriculturist wants; he wants a paper (when he does so at all, and he is proverbially lax in that direction; and it would be well for him to realise the power he has in the pen, for the benefit of his own interests) where he can see how the market is for his own particular line of produce; where the best market is; the facilities for reaching that market, and what the crop prospects are like; whether a light or heavy one in his particular line; whether it be stock cereals, fruit, poultry, honey, or vegetables, so that when he comes to sell, he knows how things stand.

Then again, he wants a paper where he can discuss matters pertaining to his own line of business, and ventilate anything that is a grievance, and wants setting right, and new ideas and methods in working or marketing. Should a matter crop up in which it is necessary to "haul the department or Government over the coals," so to speak, I doubt very much whether the *Journal* could publish it, so that in some vital matter the agriculturist would find the *Journal* useless to aid him; and it is these matters that come home nearest to him, that interest him most, and are the most important.

Take, for instance, the honey industry. The Under Secretary's report discourages any further development, on account of the production having reached the State's requirements, and says it would not pay to export honey. Why, there are infinite possibilities for it, the industry is only in its infancy, and could bring a large sum of money into the State by export, if gone about in a proper way, and it should be the duty of the Government and Agricultural Department to help to develop and set on a proper footing, not only all its industries from natural sources, but also the marketing of the productions of same by export. How else are we to bring wealth into the

country except by export, and that through the natural resources, which are termed the backbone of the country.

It does not seem as if there will be any Beekeepers' Conference this winter, and apparantly the W.A. Beekeepers' Association has died out, through, possibly lack of support by the beekeepers themselves, and the lack of support from the Department. Now this is a pity, as, if a number of members could be got together, it was intended to try and establish an export trade in honey, and ask the assistance of the Government in the matter.

Trusting, Sir, you will publish this, and it will set the ball rolling in all lines of agriculture in your *Journal*, and that farmers will not neglect to use the pen, as well as the plough, as one of the most necessary implements of their calling.

F. H. LAYTON,
Sec. S.W. Central A. and H. Society, Donnybrook.

GRASS FROM GOLDFIELDS FOR IDENTIFICATION.

By ALEX. MORRISON.

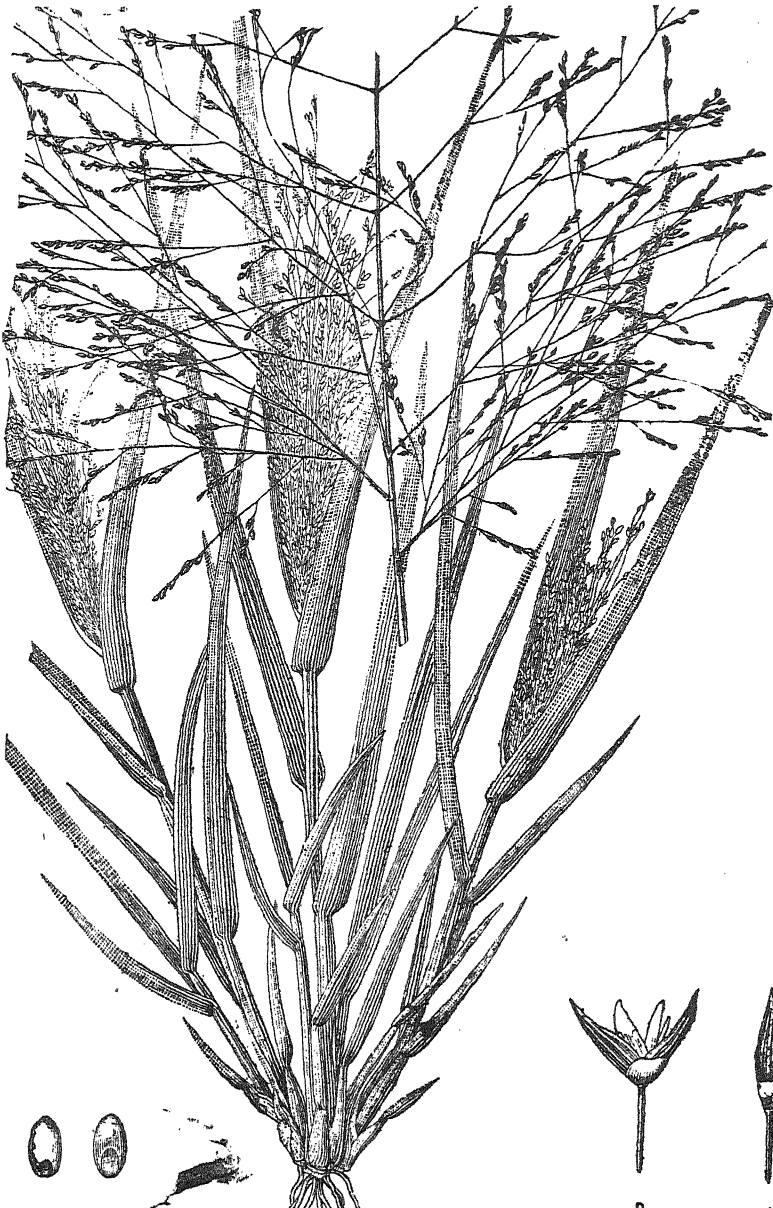
The specimens of grasses received from Siberia comprise four different species, each of which shows a luxuriant growth, which may readily be accounted for by the fragments of red loamy soil adhering to their roots in combination with a copious supply of moisture where the, were grown.

Panicum decompositum.—"Australian Millet," grows in all the Australian States, in the warmer latitudes, and is found also in East India. It thrives best in wet places, grows very quickly, and produces a large amount of herbage of nutritious quality. The seed is produced copiously, and the grains, which are of substantial size and made use of by the aborigines for food, add considerably to the nutritive value of the grass.

Eriochloa punctata.—"Early Spring Grass," is a deep-rooted perennial, found native in the warmer parts of Australia, as well as in Asia and Polynesia. It produces a large quantity of rich herbage and abundance of seed, which ripens in early summer, and may easily be collected and sown where desired. Like the millet grass above noted, it may be cut before flowering and made into hay or ensilage.

Andropogon sericeus, sometimes called "Blue Grass," is a native of all the States, and also of New Caledonia and the Philippine Islands. It is a perennial grass, bears heat and drought well, and furnishes an abundant forage for cattle and sheep during the summer months.

Eragrostis falcata.—The Eragrostis, or so-called "Love"-grasses, especially those species making their annual growth in summer, are highly valued for their feeding qualities; and this species, though smaller than most, is much esteemed as a pasture grass in dry districts. Baron von Müeller has recorded of it, as well as of the Andropogon and Eriochloa already referred to, that these have been commended by Mr. Isaac Tyson, of Upper Murchison, as pasture grasses.



Panicum decompositum (R. Br. "Australian millet").

REFERENCE TO PLATE.—A, showing the relative size of the outer glume to the spikelet; B, spikelet opened out, showing the position of the four glumes and two paleas; C, grain, back and front views. All variously magnified.

Eriochloa punctata, Hamilt ("Early Spring Grass").

REFERENCE TO PLATE.—A, spikelet opened out, showing the three glumes and palea; B, floret; C, grain, back and front views. All variously magnified.

PIGS AND DAIRYING.

That pigs and the dairy go hand in hand has been a recognised feature in farming for many years. Every dairyman made it a rule of economy and profit to carry enough pigs to consume the by-products of the dairy, consisting of skim-milk, buttermilk, and whey. It has been asserted many times by many dairy farmers that great profit was derived from the pig end of the dairy. That unless they brought the hog into the contract the could not balance their books with a profit.

The farmer and the hog-raiser who is located near unto a creamery considers it in the nature of a franchise to be thus situated, to enable him to buy the separator milk or butter milk from the creamery, as the matter of hauling is taken out of the expense by his location.

Whole milk is a balanced ration for growing pigs. When the butter fat is extracted from it, it needs a little oil cake meal to make a good substitute, of course, much cheaper than the butter fat, one being a little over a cent a pound, while the other over 1,000 per cent. more.

That the farmers were not mistaken in their value placed upon milk as a pig feed has been scientifically proved by the experiment stations time and time again, as it was practically proven by these early farmers. It has also been determined by the experiment stations scientifically and practically that milk mixed with corn or shorts was vastly better than either of them alone, thus carrying out the practical benefit of a balanced ration.

Some of the experts in preparing hogs for the shows and in growing and developing them in bone and muscle have learned, and are aware of the superior qualities of sweet full milk fresh from the cow in bringing about marvellous results. If the animal has the merit, he will make a quick response to good feeding on rich sweet milk.

But the farmer who has skim-milk either of his own production or produced from the creameries finds it very profitable, even in feeding for the pork market. It is a grower of bone and muscle. A developer and frame-builder especially when mixed with shorts or corn meal or some other good grain ration.

A feeder must at all times take into consideration the price of grain. There have been years when corn was extremely low. There have been other years when wheat was abnormally low, and, of course, the by-products of the wheat, bran and shorts, would be correspondingly low, and all these things go into the consideration of the man who is farming in a business way, looking to have profit in the end of his transactions.

No farmer can afford to overlook the great value of milk and the by-products of the dairy in growing pigs, and every dairyman must take into consideration the fact that his by-products can be most economically fed to pigs. Thus pigs are the real hand-maids of the dairy to-day, as they were 75 years ago, even with such marked changes wrought in our methods of farming then and now.—*Exchange.*

EXPERIMENTS IN POTATO GROWING.

Some little time back the Melbourne *Argus* sent out circulars to farmers throughout Victoria asking them to fill in particulars as to planting, cultivating, and cropping potatoes. The replies were numerous and as the published information is likely to be of value to the growers in this State some of the most interesting replies are here reproduced.

It would perhaps be as well to read the report on the result of the potato tests made at the Experimental Farm at Hamel, and published in this issue of the *Journal*, in conjunction with the present article.

As regards fertilisers the best results throughout this State have been obtained by issuing a formula published at various times in the *Journal* which is as follows:—

			£	s.	d.
Sulphate of Ammonia	224lbs.	cost	1	4	0
Superphosphate	560lbs.	„	1	12	6
Sulphate of Potash	224lbs.	„	1	12	0
	9 cwt.		£4	8	6

Apply at the rate of 3cwt. per acre in drills with seed, and this will supply to the ground 18lbs. of nitrogen, 50lbs. of phosphoric acid, and 40lbs. of potash. When planting is commenced during the rainy season it is as well to divide the quantity of fertiliser to be used, applying one half with the seed and the remainder when the plants are half grown.

The production of potatoes in Western Australia for the year 1905 was 5,614 tons, and the imports were 13,760 tons, so that little more than one-quarter of the consumption was grown in Western Australia. As the average cost of potatoes landed here is fully £6 per ton, this means that £82,500 was sent away for this food item alone. As most of the potatoes required could be raised here with proper and intelligent culture, this article should be of interest to our local producers, and a large proportion of the £82,000 retained here and distributed among West Australian gardeners and farmers. The following are the various results:—

Mr. John Glenn, Tylden.—"I plough the ground twice, harrow twice, and roll twice, and use special potato manure at the rate of 1cwt. to the acre. I plan the first week in September for the early crop, and first week in October for the main crop. Whole seed is used one year, and cut seed (which is sprinkled with lime) the next, about 12cwt. to the acre. The potatoes are planted 15in. apart, and covered about 5in. When harvesting we make two samples, putting seed and small potatoes in one lot and market potatoes in another; and when they are stored they are put in a pit and covered with four or five inches of straw. For early crop I like Early Vermont; and for main crop, Brown's River or Peach Bloom."

R. Goodman, Lindenow.—"I plough the ground 9in. deep in June, and again 3in. when planting. No manures used. Plant in August for early, and November for main crop. I select for late crop large, even potatoes, and for the early crop from second crop seed. It takes about 11cwt. per acre of the early seed and 14cwt. of the large late. The latter is cut square only one day before planting. Early potatoes are planted 14in., and late

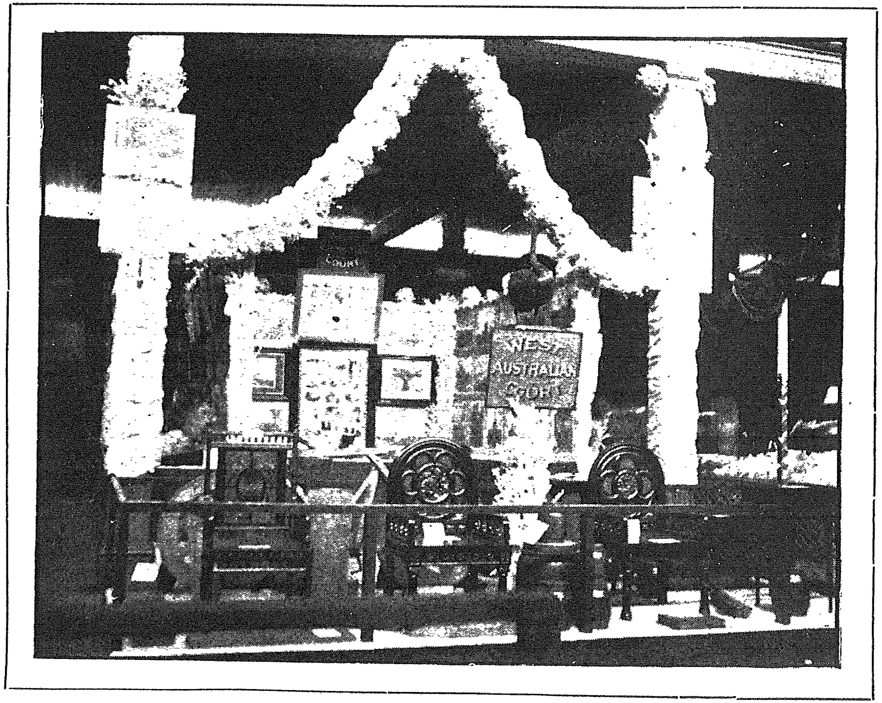


FIG. 4.—Front view of West Australian Court, Melbourne Exhibition.

ones 18in. to 20in. apart, in rows 2ft. 3in. to 2ft. 9in. apart, with a 3in. covering. The ground is harrowed well before covering, and after and during the growing period scarify as often as required, and hill up. We harvest a good crop by hand-digging with a fork, and a poor crop with a machine. Yield, 5 to 12 tons per acre. When stored, this crop is pitted and kept dry with bark and straw. The best varieties for early crop are Early Rose and Beauty of Hebron, the latter giving the heaviest crop, but it is liable to second growth. Brown's River and the old PinkEye are hard to beat for late sorts. I always plant a large quantity after two seasons of very low prices, and generally come out all right with early ones."

G. F. Coates, North Brighton.—"I fallow the ground in autumn, and use Riverina bone-dust, 6cwts. to the acre, or farmyard manure, 12 tons, spread well over the land. For autumn crop I plant in January, and for the early spring about June 21; and for main crop, August. In selecting seed, I leave a few lands to ripen, and pick the best. For the autumn crop, I plant whole potatoes, 10cwts. to the acre; and in spring pieces cut to one eye, 8cwt. to the acre. Plant by hand four inches deep, and cover with the plough; distance, 15 inches by 27 inches. Scarify when up, and hoe three or four weeks afterwards. Harvest when nearly ripe, and market in cases in Melbourne market. Yield, about six tons per acre. Kidney and Beauty of Hebron are the best varieties for early crop, and Cannon for main crop. These remarks apply only to Brighton and district, where we get two crops a year. We buy seed from other districts to plant in June, and plant our own seed in January and August. I get Kidney seed at Lang Lang, and Cannon at Romsey."

R. A. Colliver, Lancefield.—Area cultivated, 50 to 70 acres; average yield, about four tons per acre:—"After the hay crop is taken off, the ground is ploughed as soon as possible, and left in the rough till September, then cultivated twice, and harrowed and rolled until brought to a fine tilth; then ploughed again, and if there is any sorzel it is again cultivated and worked as before until perfectly clean; then rolled down, and is ready for planting. I am a firm believer in the value of green manuring with peas, and when this is intended the ground is ploughed after harvest and thoroughly cleaned; then ploughed in May about the last week and drilled in with peas, $3\frac{1}{2}$ bushels to the acre. The peas are ploughed down when they come into bloom, which is about the last week in October, at the same time planting the potatoes under the peas. I find this better than all the manure you can buy, though I have spent a lot of money in artificial manures and experimented with test plots. From the peas you get the benefit for several years, especially on the barley following. I work on the four-course system, so the same crop comes every fourth year. Plant the main crop in October and November. I select seed from the best potatoes of seed size, and use large ones, cut, every third year. It takes about 10cwt. of seed to the acre. The rows are about 27in. apart and 22in. between the sets. They are covered with a three-furrow plough, which keeps two planters going. After being planted they are harrowed and rolled, and harrowed twice or three times when coming through the ground; then horse-hoed when the rows are visible. We harvest with forks at so much per bag. When stored, the potatoes are pitted or laid on the ground in a heap and thatched with straw. Width of pit, 11ft.; height, 5ft. Potatoes are picked from the pit for market at 2s. per ton. Best varieties for main crop, Brown's River."

N. R. Cooper, Murrumbeena. Area cultivated, 30 acres; average yield, 4 tons per acre:—"The ground is prepared by ploughing and disc

harrowing; 6cwt. to 7cwt. bonedust or five wagon loads of stable manure to the acre used. The early crop is planted first week in June; the main crop first week in August. I select the best medium-sized potatoes for seed, 6cwt. per acre, cut, and dusted with lime. The seed is ploughed in about 5in. deep, and then harrowed; also horse-hoed and hand-hoed during the growing season. The crop is dug by hand labour. The best variety for the early crop is Lapstone Kidney, and for main crop Excelsior and Beauty of Hebron. Excelsior has given me the best results, having yielded up to nine tons to the acre. The time is not far distant when horse-hoeing potatoes will be done away with. I have experimented, and where I have not horse-hoed I have the best crop. Some of the new varieties, such as Northern Star, Up-to-date, and Carmon will become popular. The coming spring will prove some of them."

W. Armstrong, Carrum. Area cultivated, 70 acres:—"In deep soil I plough about 12in. deep, and repeat the ploughing as often as possible, and harrow thoroughly. Use 3cwt. to 4cwt. potato fertiliser to the acre. Plant in the beginning of September. Seed potatoes ought, if possible, to be thoroughly matured before they are harvested, so that the seed will not lose its skin. Select medium, oval-shaped potatoes for seed, about 7cwt. to the acre, cut in fairly large pieces, and dust with ashes. Plant about 18in. apart. Blue varieties require about 3ft. Early potatoes planted 4in. deep; blues 6in. In damp soils, like those of Carrum, potatoes require to be ridged up in narrow lands. When harvesting we dig and bag-up as soon as possible. If allowed to lie on the surface long, potatoes get a strong flavour. They are sent direct to market when bagged. Best varieties of early and main crop Beauty of Hebron, Carmon, Up-to-Date, and Rose. To be successful in potato culture you must study the soil, as deep ploughing is required in some lands, and shallow ploughing in others. The selection of good seed to suit your land is one of the secrets of success. Plough and harrow thoroughly, and keep free of all weeds."

David McCallum, Blowhard. Area cultivated, 10 to 15 acres; yield, 2 to $3\frac{1}{2}$ tons per acre:—"Ground ploughed in February, again in June, and harrowed down fine; about 3cwt. or 4cwt. bonedust sown in the drills with the seed. Main crop planted end of August; change of seed obtained from some other district every second year; medium-sized potatoes, cutting into three or four sets, with two eyes each, used; about 6cwt. to the acre planted, freshly cut. New Zealand Pink Eye is the only variety to rely on for yields. Early Vermont and Beauty of Hebron do in small areas, heavily manured."

George H. Lister, Glen Luce. Area cultivated, 12 acres; 4 tons per acre:—"Ground ploughed in June and left in the rough till planting. Start planting beginning of October, and finish before the end of November; whole seed is chipped to discover faulty sets. Large potatoes, cut, give best results. About 10cwt. of seed to the acre used. Just before the potatoes show above ground (about a fortnight after planting), the ground is harrowed, and when the rows appear the horse-hoe is set to work. Best variety for main crop, New Zealand Pink Eye; and for early, Early Vermont, kidneys, and Snowflake. Don't plant twice in succession in the same ground, and don't cut the sets too small."

William Long, Glenormiston. Area cultivated, 30 to 40 acres; average yield, eight tons per acre;—"Land ploughed in autumn and harrowed and rolled, and again ploughed in September. No manure used, as the ground is rich. Main crop planted in September. Medium-sized, well-

shaped potatoes used for seed, cut into junky sets; 8cwt. or 9cwt. to the acre. Varieties grown: New Zealand Pink Eye, ordinary reds, Beauty of Hebron, and common variety. I like the Tasmanian reds, which do well here after the first year. It takes a year to acclimatise them. When storing we pit them. There is really no pit; they are simply heaped in a long row on the ground, and covered with straw, grass, and potato stalks."

There are a number more but the cultivation, results, etc., are so similar to those selected that it is hardly necessary to reproduce them. It should be borne in mind that no hard and fast rule can be laid down, every grower must experiment for himself, and when he finds that a certain variety will do better with him than another, then that is the kind he should go in for, always bearing in mind that his aim should be to grow the kind of potato that will sell best. Buyers usually prefer a medium to large kind, shallow eyes, and a pink-tinted flesh.

It will be seen that the average yield of potatoes to the acre is much less than that obtained at the Government Experimental Farm at Hamel recently, the report of which appears in the *Journal*, and has already been referred to in this article.

LADYBIRDS *v.* WOOLLY APHIS.

By Inspector David L. Breen.

On the 27th inst. I made another inspection of Mr. Muir's, Forest Hill, Mount Barker, to see the result which has attended the introduction of the ladybirds *(Leis Conformis)* introduced from Tasmania and liberated last year on the apple trees infested with woolly aphis. This orchard is one of the old-established ones of the district, and as a number of the apple trees were not on blight-proof stocks the pest made great headway when once introduced, and has been to the owner a source of worry and expense to keep it any way within bounds. At present, so satisfactory has been the work of the ladybirds, there are only a very few apple trees with any trace of the woolly aphis, and these seem to have been missed by the ladybirds, although numbers were placed on them while these friendly insects were plentiful. Mr. Muir informs me that he intends to thoroughly spray immediately all infested trees, and destroy all trees not of blight-proof stocks, and hopes by this means to eradicate the pest, which has been reduced to such a small matter by the predaceous insects.

Numbers of another kind of ladybird, the *Oreus Australasiæ*, indigenous to this country, are present in the orchard, and are doing good work on the Greedy Scale, the soft Brown Scale, and the Black Scale, but no trace, so far, of the internal parasites lately liberated for the two latter could be discovered.

MANURIAL EFFECT OF BONE-MEAL.

Experiments which have been carried out with bone-meal in comparison with other phosphatic manures have frequently shown that the action of the phosphoric acid in bone-meal is, as a rule, less than it is when in the form of superphosphate, although in many instances the reverse has been found to be the case in actual practice. Professor Söderbaum, of Stockholm, has recently published the results of some experiments in this connection which are of considerable interest.

It was pointed out in 1900 by Kellner and Böttscher that the experiments which gave results unfavourable to bone-meal were made either on soils which were naturally strongly calcareous or on those to which carbonate of lime had been added. They found, in fact, that the effect of bone-meal was much less on calcareous soils, or on soils manured with lime, than on unlimed soils, and that the manurial action of the phosphoric acid in bone-meal depended very largely on the lime-content of the soil. After attention had been directed to this point, pot experiments were carried out, which gave results favourable to bone-meal, though a smaller crop was still obtained than after superphosphate or basic slag of a corresponding quality.

This fact admitted of two explanations. On the one hand, it could be assumed that the bone-meal, in consequence of its slow solubility, hardly ever exercised the same phosphatic action as superphosphate; at any rate, not on plants such as spring grain, with only a short-growing period. On the other hand, there was the possibility that besides the lime-content of the soil, there were other factors still unexplained which were able to increase or decrease the action of the phosphoric acid in bone-meal. An examination of the results of experiments with bone-meal compared with other phosphates showed that in by far the greater number of experiments sandy soils, or, at any rate, soils poor in humus, had been used. The phosphoric acid in bone-meal, however, is best employed by plants in soils rich in humus, a fact which is usually explained by the statement that the acid properties of the humus make bone-meal more easily available. This explanation is not altogether satisfactory, as there are several reasons for supposing that one is dealing here with a somewhat more complicated process than the simple one of making soluble a substance insoluble in water, in a way similar to that which occurs in treating basic slag with a two per cent. solution of citric acid.

A higher proportion of humus, it must be remembered, implies an entire modification both of the physical as well as of the chemical properties of the soil; for example, in a soil rich in humus, the nutrient plant materials, as well as other substances, exist in different proportions, and particularly in other combinations than is the case in a soil poor in hnmus. This applies in the first place to nitrogen. Whilst in artificially-manured soils, poor in humus, nitrogen occurs largely in one form, most frequently in the form of nitrate, the soils rich in humus contain their nitrogen partly as nitrate, partly as ammonia, and partly as organic combinations of various kinds. It is not altogether unlikely that the form in which nitrogen is present in the soil, as well as the more or less acid

reaction of humus, may influence the availability of the phosphoric acid in bone-meal. Some experiments by Prianischnikow are referred to as bearing on this point, in which it was shown that sulphate of ammonia when partially substituted for nitrate of soda acted very favourably when used with raw mineral phosphate, and gave results equal to those obtained from superphosphate and nitrate of soda. When the nirate of soda was replaced by nitrate of ammonia, similar results were obtained, and the latter was found to be equivalent to a mixture of nitrate of soda and sulphate of ammonia. If, however, the nitrate of soda were entirely replaced by sulphate of ammonia, an opposite effect, curiously enough, occurred, and the development of the plants under experiment was seriously retarded. These experiments were all made in combination with mineral phosphate. When an easily soluble phosphate, such as superphosphate, was added, the mixed nitrate of sode and sulphate of ammonia manure was found to act somewhat differently, and indicated that the addition of nitrogen, in the form of ammonia, resulted in a proportionately decreased yield.

It seemed from this that the simultaneous presence of two or more different forms of nitrogen was advantageous in enabling certain phosphates, namely, those difficult of assimilation, to produce their full effect, and Professor Söderbaum's experiments show that bone-meal, in the presence of salts of ammonia or organic combinations of nitrogen, yielded, without exception, larger crops than when the nitrogenous manures consisted exclusively of nitrate of soda. This was found to be also the case with Algerian phosphate and precipitated tricalcic phosphate.

This increased yield occurred both with mixed manures of nitrate of sode and sulphate of ammonia, and also with ammonia alone. Indeed, in the latter case the crop reached its maximum.

The yield of grain was increased throughout to a greater extent than that of straw, particularly in those cases where the manuring was carried out with organic combinations of nitrogen.

The increased crop produced by the addition of ammonia varied, within fairly wide limits, from year to year, according to the various meteorological conditions.

In favourable cases, the total crop, after bone-meal, was more than doubled, and the grain crop nearly trebled.

With superphosphate, basic slag, and precipitated dicalcic phosphate, the employment of ammonia led to no increased yield; rather, in individual instances, to an unimportant diminution in the crop.

When employed on soils free from large quantities of lime, bone-meal may be expected to have as great an effect in respect to its phosphoric acid as superphosphate, provided that salts of ammonia are present at the same time.

It may be pointed out that the above results exclusively .refer to the experimental conditions; whether and to what extent they are of general application will form the subject of further experiments.—(*Deutsche Landw Presse*, January, 1906.)

FRUITS RARE AND COSTLY.

LUXURIES OF MILLIONAIRES.

HINTS FOR WESTRALIAN GROWERS.

The following interesting chat about the London fruit market and the enormous prices paid for certain varieties is from a recent number of *Lloyd's Weekly Newspaper*. In view of the Australian fruit season being six months earlier than that of Great Britain the possibilities of developing a large and lucrative trade with the mother country are unbounded:—

"For most people summer is the season of our fruit carnival; then strawberries, cherries, and plums overflow our markets, and are sold in the streets at popular prices. A pound of the most delicious of earth-grown fruits—the Germans call them earth-berries—costs no more than a loaf of bread.

"But there is fruit which, whatever it may be in the order of nature, at certain seasons commands gold. You may see it in bulk at the great wholesale house of Monro, in King-street, Covent-garden, or displayed to greater advantage as a thing of beauty in the Regent Street windows of Brooks', the well-known fruiterers to the King. And it all comes, more or less under two categories—forced fruit, which is a very ordinary fruit, but rare from being gathered out of due season; or fruit which is not producible in large quanties at any time, which requires specially costly circumstances for its coming to perfection.

"There are strawberries which have sold in the very early spring for thirty-two shillings a pound—that is, at about two shillings apiece. They are not nicer than—as a matter of fact they are not so nice as—those which, towards the latter part of June, you may buy at sixpence a pound. But your very early forced strawberry represents a vast amount of labour, care, and expense. As was observed to me at Monro's, it has to be watched like a sickly child, lest, through a moment's inadvertence, it should collapse. In any case a strawberry will not ripen without sun, and advantage must be taken of every burst of spring sunshine. That is why the production of this class of forced fruit is confined largely to the neighbourhood of Worthing, on the Sussex shore. The earliest in the market fetches the record price. As the weeks go by hothouse strawberries arrive in ever-increasing quantities. With the advancing spring they are taken out of the houses and put in specially prepared pits to ripen, and these pit-grown strawberries, sold in May at four or five shillings a pound, are really very handsome and attractive specimens of their kind.

"Melons in their season provide a lot of good eating for those who like them at a moderate cost. And to my thinking there are worse things on a hot day than a good ripe melon, judiciously seasoned with powdered sugar. But your cantelupe melon, that is another matter. In the autumn, in its gigantic prime, it is only for the well-to-do; in the May time it is for the rich; in the winter for millionaires. I saw a little one in Brooks' window in early May. I did not measure it, but it was about twice the size of a large orange. I asked its price. It was thirty shillings. Now this melon is

bought out of its season, when it is as yet very small, to be cut in slices which are served on ice as hors d'œuvres—appetisers at the beginning of an epicurean feast. The big fashionable hotels are the purchasers of this particular dainty. Indeed, the manager of one of them told me that he sold a small cantelupe melon to a dinner party last winter for six guineas. As it only cut up into six slices the rate was a guinea a slice. Plainly Lazarus is not in a position to open his mouth in a style so expensive.

"One of the most interesting of rare fruits is the Japan Kelsey plum. I suppose in its season it is plentiful enough in California, but we get ours from South Africa in the early spring. They all come from Mr. Rhodes's farm near Capetown. The African Colossus imported his young trees from the great Pacific State of the Union, and they throve in their new habitat. About a dozen years ago the staff at Monro's saw Mr. Cecil Rhodes himself enter the spacious premises of the firm and order a number of the Japan Kelsey plums for a dinner party he was giving. He paid two shillings a plum, and it is possible he did not know he was purchasing his own wares.

"Hothouse peaches are not a fruit ever likely to compete for the coppers of the million, or, indeed, English peaches of any variety; though the fruit is said to be so abundant in some parts of America as to serve for the fattening of hogs. In Regent-street about the middle of spring you may see splendidly handsome English peaches, and a well-known foreign prince, when staying at a West-end hotel, has looked in casually, admired the fruit, and ordered a dozen at half-a-sovereign apiece. It is flattering to our self-love to know that English hothouse peaches are first favourites in the market. The French cannot reach them in quality and appearance, and though their hothouse peaches obtain good prices they do not attain in that respect to the English altitude. In this connection, I may mention that an attempt has been made in recent years to put Argentine-grown peaches on the English market, but with no great success. I saw some in boxes at Monro's on their way to New York. It seems odd that fruit should cross the Atlantic twice to arrive at its destination and travel from South America to North *via* Covent Garden. So it was, however, with these peaches, though I was given to understand that in point of flavour they left a good deal to be desired. Still, they were here before our hothouse peaches arrived, and when there must have been a dearth of the fruit also in New York, where doubtless they went to furnish some multi-millionaire's table.

"There is one sort of apple which commands high prices, because of its rarity and also for its real or supposed hygienic qualities. It is a good deal recommended by medical men to invalids, so I was told at a great fruiterer's establishment. It is known as the Calville, is a winter apple, and so far has only been grown successfully in France. Calville's sell sometimes for as much as eighteen shillings a dozen.

"I overheard a feminine voice say as its owner scanned the fair array in the Brooks' window and the impressive prices on the tickets, "It seems almost a sin, don't it?" The lady was plainly not a grower nor a seller of such produce. Moreover, although much rare fruit only goes to add to the costliness of luxurious banquets, some of it meets the needs of the sick, who are often strangely fanciful in such matters, and if a man of great means has someone dear to him ailing who fancies strawberries when they are worth a guinea and a-half a pound why should he not buy them? After all, Midas can spend his surplus guineas in worse ways than on fruit."

SPROUTING SEED POTATOES.

For many years the growers of early potatoes have been in the habit of storing their potato seed in trays or boxes in thin layers, in order that the tubers should sprout before being planted, but it is only lately that the boxing and subsequent sprouting of late potatoes have been found to be profitable, says the *Journal of the Board of Agriculture*, England. The experiments on this subject, carried out by the Irish Department of Agriculture, showed that the increase due to sprouting varied in 1903 from 10cwt. to three and a-half tons, and in 1904 from 13cwt. to over six tons. The increased yield in the latter year averaged two tons 13cwt. per acre, representing over 25 per cent. on the average crop from unsprouted seed, and in only two cases was there a decrease.

A similar experiment was carried out in 1905 by the Aberdeen and North of Scotland College of Agriculture at nine centres with a view to ascertaining if the sprouting of late potatoes in the comparatively late climate of the north-east of Scotland would be profitable. From these trials, it may be fairly assumed that this system is likely to prove advantageous with late varieties and in a late district in a year like 1905. The advantages of sprouting are summarised by Mr. R. B. Greig, in his report on the experiment, as follows:—(1) In a normal year, the crop is heavier; (2.) there are fewer small and more saleable tubers from sprouted sets; (3.) in a late spring, sprouted sets may be planted late without a reduction of crop; (4.) where autumn frosts occur, little damage will be done, as the potatoes from sprouted sets will be more mature; and (5.) a crop from sprouted sets may be raised sooner than a crop from ordinary sets.

The disadvantages are perhaps equally obvious.

1. There is first the initial cost of the boxes. Potatoes will sprout on a floor or in any kind of box, but the most convenient size of box is 24in. long, 12in. wide, and three inches deep, with corner pieces seven inches high, so that the boxes can be piled on each other to any height without interfering with ventilation. It is of importance that there should be a cross handle fixed into the side pieces for convenience of carrying. Such boxes will hold about 20lb. of potatoes, and can be purchased in Aberdeen at 30s. per 100.

As 100 boxes are sufficient for one acre, and the boxes will last several years with ordinary care, the cost is spread over, say, six years, and is therefore 5s. per acre.

2. A storage space is a difficulty where a large area is planted, but where only a few acres are grown, or on crofts, the boxes may be stored on the couples of the byres or cattle sheds, and the sets will do quite well there.

3. More labour is required at planting, but the difference as compared with the ordinary method is very little, and, where the boxes described above are used, it is scarcely appreciable.

Treatment of the Sets.—The potatoes for seed may be placed in the boxes when lifted in the autumn, or they may be removed from the pits any

time in winter. They require no arrangement, but are simply scattered in the boxes in one or two layers, without earth. When the sprouts are about two inches long, growth may be stopped and the sprouts toughened by exposure to light. When hardened in this manner, the sprouts do not break off easily and the sets may be dropped in the drills in any position. It is not advisable to cut sprouted sets, and the best size for boxing is about one and a-half inches, or what would pass through a one and three-quarter inch riddle and be retained by a one and a quarter-inch riddle.

COMPARATIVE VALUE OF OIL-CAKE AND ARTIFICIAL MANURES.

Cakes and other feeding stuffs are often bought by farmers when both their stock and their land could be equally improved by cheaper means. The so-called "Manuring for Mutton" experiments which have been carried out during the past nine years have proved conclusively that artificial manures, costing less than a pound per acre, may often so improve the quality of the herbage that sheep will lay on more mutton than similar animals grazing similar unmanured land alongside, though the latter animals may be getting as much of the richest cake as they will eat. What holds good with regard to sheep is doubtless also true with regard to cattle.

As regards the manurial value of cake consumed by stock, it must be remembered that this is, in many cases, much less than would in theory be expected. In the first place, the value of the manure made from cake depends, as in the case of artificial manures, on the presence of the three ingredients: nitrogen, phosphoric acid, and potash. But in using artificial manures, one only of these substances or any two of them can be applied in any desired proportion, whereas in cake residues they cannot be thus separated and dealt with. It is, however, a fundamental principle in manuring that the composition of the manure should be regulated by (*a*) the deficiencies of the soil, or (*b*) the particular requirements of the crop. There are wide areas of pasture in this country which not only require no nitrogen or no potash, but which are actually rendered less valuable by receiving these substances. In cases where a soil contains abundance of nitrogen, or where a plant can draw its nitrogen from the air, it is wasteful to supply this element in the manure, as is unavoidable in the case of cake residues containing all three manurial constituents.

In cake residues, moreover, very great waste takes place in the farmyard manure itself. Lawes and Gilbert put this loss at 50 per cent., and this view has been endorsed by Voelcker and Hall. Thus, although the manurial elements of a ton of linseed cake are theoretically worth £2 11s. 11d. as the residues leave the animal, they are worth very much less by the time the farmyard manure is carried to the land and offered to the crop. Not only is there this loss of manurial value in cake residues before the farmyard manure that contains them reaches the land, but probably no more than one-half of the nitrogen that is left is taken up by the crop to which it is applied.

CAMPBELL SYSTEM OF SOIL CULTURE.

Mr. H. W. Campbell, writing to the *Rural Californian*, says:—

"The so-called Campbell system of soil culture that is attracting such widespread attention throughout Western Kansas, Nebraska, Eastern Colorado, and the Panhandle of Texas because of the marvellous results in wheat, corn, potatoes, sugar beets, and fruit trees that were grown by this system during the past six years, and especially the increased acreage of 1904-5, have now assumed the proportions of something more than a mere pet theory.

"Railway companies who operate lines traversing the above territory now recognise and acknowledge that it has been the principal factor in a vast increase of tonnage and bringing in hundreds of new families who are building up ideal and prosperous farm homes. Although any of these railroad companies would have gladly endorsed scientific soil culture 12 years ago, when we first began appealing to them and the farmers, but they, like the farmers, were sceptical. While they have waited they have watched; seeing is believing.

"As we ride over these different railroads to-day through this territory and note the vast improvement of the many old towns; in their streets, sidewalks, and buildings, as well as new and more substantial business blocks, we know there is but one cause for it, and that is the greatly increased prosperity of the farmers in the surrounding country. Then as we speed on we note the cheering, stimulating change in the country by an increased acreage of these fertile prairies under cultivation, more young trees and orchards, as well as many new and substantial farm houses. Nothing affords us greater pleasure than to note the firm step of these farmers and their expression of countenance, indicating faith in the country and high hopes for an ideal farm home in the very near future. In observing all this we were frequently constrained to say, 'God bless these farmers.' They will never know the woes and sorrows of their predecessors, who knew nothing about scientific soil culture, and again we appeal for blessings upon these farmers (many of whom we know have come from the large cities). Their children will never know the sorrows of the slums of the great cities.

"Right here let me call attention to some facts we have just obtained from the superintendents of the reform schools in Kansas, Nebraska, and Iowa, and that is, that less than 10 out of over 1,000 boys confined in these institutions in these three States come from the farm direct. Is not this alone sufficient cause to render most sincere thanks to God for the means that shall not only bring a few families from the city, but shall encourage many young men to remain upon the farm?

"Did it ever occur to you that the building of new houses and barns upon the farm and the buying of better stock, new buggies, pianos, carpets, books, pictures, in short, all that goes to make the farm home pleasant and attractive, and the farmer and his family happy and contented, depended entirely upon the yield of your cultivated fields? Then is there any one thing that means more to the farmer and his family, to every branch of

business, from the pea-nut stand on the corner to the National Harvester Co., than such an advanced knowledge of the general principles of soil culture as shall enable every farmer to accomplish what a few have already done?

"A farmer on the high-level prairie of Western Nebraska, near Trenton, in Hitchcock County, in 1904, when 90 per cent. of a large acreage of wheat was a total failure, and the best yield in the county was a field adjoining this farm and only yielded 10 bushels per acre, and yet this field handled by the Campbell system, and without any irrigation, yielded 41 bushels of 60lb. wheat per acre—1,640 bushels from 40 acres.

"The Pomeroy Model Farm at Hill City, Graham County, Kansas, the same year, harvested wheat that yielded 40½ bushels, when adjoining land that was even considered better was not worth the cutting.

"A banker at Grainfield, Kansas, who hired all his work done, prepared 60 acres of ground under this system in 1903, and harvested in 1904 enough wheat so that he was able from its proceeds to pay all expenses of preparation, harvesting, threshing, and marketing, and had left as a net profit $16 per acre, or $960, just 10 per cent. on a valuation of $160 per acre, and this away out in Western Kansas, when many failed entirely.

"At Walsenberg, Colorado, at an altitude of 6,800ft., 40 bushels of corn per acre was grown by this system in 1904 and 1905.

"Many similar yields of corn are reported in Colorado at altitudes ranging from 4,800ft. to 6,000ft. This refutes some of the old accepted theories.

"What is true of corn in the higher altitudes in Nebraska, Kansas, and Colorado is also largely true in northern States or sections of a lower altitude.

"These very marked yields are the direct result of a better knowledge of how to till the soil. Later experiments along this same line point clearly, not only to even greater results, but to the fact that man, through a higher and more scientific knowledge of the soil and how to cultivate it, can guard against any possible failure by drought, even where the average rainfall is not more than 12 to 15 inches, and this without any artificial irrigation.

"You, who are not familiar with these facts, don't say impossible, but rather investigate. These general principles mean much to every farming community of North America, but are vital to the more arid sections. Scientific soil culture is the stepping stone to a higher plane of general prosperity, and the one thing above all others that will prevent any serious financial depression throughout the great West."

PIG-RAISING.

Pig-raising deserves more attention than is paid to it by farmers. A correspondent in a recent issue of the *Argus* stated that "pigs are practically unsaleable now. About two years ago a tidy slip would bring 20s.; now, however, only 4s.; and yet, in the face of this low price, one sees pickled pork marked in Melbourne shops 8d. per lb., whilst bacon rules at 10d." Inquiry shows that this correspondent greatly exaggerates when he says that pigs are unsaleable. It is true that the price paid for bacon pigs is lower than it was two years ago, but it is still a profitable one. Two or three years ago pig-breeding was slowly recovering from the effects of swine fever and the drought. The fever destroyed great numbers of pigs, and the prices of feed during the drought year checked breeding. Consequently the number of pigs decreased, and prices for bacon pigs of 120lb. to 150lb. (the favourite weights with the manufacturers) rose to 6d. to 8d. per lb. These prices were due to abnormal conditions, and it is obvious that there could be no expansion of the bacon-curing industry if they continued to rule.

A leading firm of bacon-curers, who not only buy pigs in the Melbourne market, but send their buyers to purchase in the principal pig-raising districts of the State, paid during June, July, and part of August last an average price of 4¼d. per lb. dead-weight for the lowest line of pigs purchased. From 29th August to 12th September the price rose to 4½d. From 26th September to 10th October it was 5d., thenceforward to 14th November, 5¼d. On 22nd November it fell to 4½d., and on 6th December to 3½d., at which rate it remained until 6th January, when 3¾d. was paid. On 27th February it advanced to 4¼d., and on Saturday (31st March) to 4½d. During September, October, and November the bacon factories are in full swing, and the demand for pigs brisk, but in December and January the weather conditions are not so favourable for killing, and prices always ease a little during that period. The 10 months covered by this return show that only in the month of December did the price fall to 3½d. The present price (4½d.) is equal to £2 16s. 3d. for a pig of 150lb., a return which cannot be regarded as unprofitable if up-to-date methods of feeding and management are undertaken. For many years prices have rarely been below 3½d. per lb., and are generally above this rate.

Pig-breeding has not made great progress in any of the States of the Commonwealth. Coghlan gives the following return of the increase in the number of pigs for the 10-year period from 1891 to 1901:—

	1891.	1901.
Victoria	286,780	350,370
New South Wales	253,189	265,730
Queensland	122,672	121,641
South Australia	83,797	89,875
Western Australia	25,930	61,025
Tasmania	73,520	58,716
	845,888	947,357

The Victorian Government statist brings the figures up to 1904, and shows that in that year, while New South Wales had increased the number of pigs by 65,000, Queensland by 60,000, South Australia by 12,000, and Tasmania by 19,000 over the figures of 1901, Victoria had lost 64,000 in the same period. The greater part of this loss was probably owing to the ravages of swine fever.

Victoria has an export trade of pig products, viz., bacon and ham, lard, salt and frozen pork, worth £100,000 a year. Queensland also has a good export trade, amounting to £37,000 a year; South Australia sends away £7,200 worth more than she imports; while Western Australia imports no less than £108,000 worth; New South Wales, £42,000 worth; and Tasmania is just about able to supply her own wants. No successful export trade has yet been opened up with Great Britain in pig products, nor is this trade likely to come until the business of pig-breeding and management is much more widely extended.

Coghlan gives the annual consumption of pig products in the Commonwealth as 12·4lb. per head of population. In Victoria the consumption is 11·5lb.; in New South Wales, 11·9lb.; in South Australia, 11·4lb.; in Queensland, 12·5lb.; in Tasmania, 15·7lb.; and in Western Australia, 28·7lb. Assuming these figures to be correct, the present population of Victoria requires for its annual food bill about 92,000 pigs of an average weight of 150lb. each, and the Commonwealth 329,000 of the same average weight. The pig-breeder, therefore, has a large field for enterprise in providing for Australian requirements.

PESTS AND PARASITES.

CALIFORNIA AND NEW ZEALAND.

"An exceedingly interesting experiment is being carried on by the New Zealand Agricultural Department Horticultural Division (says the *New Zealand Herald*), which is likely to lead to important results. It consists at present of the export of tens of thousands of codlin moths, or rather, the larvæ of that most destructive pest. The codlin moth grubs are being sent over to the State Board of Horticulture of California, and are intended as food for the parasite, which is expected to finally eat out the codlin moth, root and branch.

"This interesting export of grubs had its origin in a letter sent by Mr. W. A. Boucher, Government Pomologist for the North Island, to Mr. Ellwood Cooper, president of the California State Board of Horticulture, asking that gentleman to let New Zealand have a consignment of the codlin moth parasites which the California Board were breeding from larvae imported from Spain. Mr. Boucher mentioned that when he was in California engaged in growing citrus fruits, New Zealand provided the first specimens

of *Vidalia cardinalis*, and that he knew how much the citrus industry of California had benefited by that useful ladybird. He also mentioned that he had long felt that an interchange of pests, with their natural enemies, between those engaged officially in horticultural work in different countries might lead to beneficial results generally. Mr. Cooper's reply was a cautious one. He stated that it would take quite a long while to supply California, but he offered to supply New Zealand with ten or a dozen colonies for £1,000, and evidently thought that this would scarcely repay them for the expenses already incurred. He gave an opening, however, which Mr. Boucher was quick to seize. He acknowledged that the work of breeding the parasite was exceedingly difficult, on account of their inability to secure proper food supplies, or codlin moth grubs, at a particular time of the year. Mr. Boucher realised that New Zealand, with its opposite seasons, would be able to send California codlin moth grubs just when they were needed by the parasite. He proposed this promptly, and promptly came a request from the Horticultural Commissioner of California, asking that codlin moth larvæ should be sent over in large quantities immediately, as hot winds had caused a serious shortage in California, and the invaluable parasites were threatened with starvation.

"At once the officers of the Horticultural Department were instructed to visit codlin moth infected orchards about Auckland, and gather the larvæ of this pest. Some orchardists thought these officials had gone mad. 'Who could want codlin moth?' There had never been such a demand made before. They were glad enough, however, to give all they had, and were generous enough not to ask payment. Some tens of thousands of grubs were collected, packed in boxes lined with stout muslin, and packed in a cool place on the 'Frisco mailboat. The chief officer of the mail steamer undertook to watch over these precious grubs with the utmost care. The great difficulty was to prevent them hatching out during the voyage across the equator, but arrangements were made to keep them at a temperature of 40 deg., and it is confidently expected that they will reach their destination in a proper condition.

"The importance of obtaining consignments of these codlin moth parasites will be recognised by all who take, or have taken, any interest in New Zealand's fruit industry. There can be little doubt that had it not been for the codlin moth, New Zealand might by now have had an export trade in apples worth tens of thousands of pounds annually, and if the work of the parasite is as thorough as is expected it will, when established here, save thousands of pounds' worth of fruit from being wasted, and relief our orchardists of much expensive and troublesome labour. Mr. Ellwood Cooper, who, in his position as the president of the Californian State Board of Horticulture, may be recognised as the leading authority in the world on this subject, speaking of the work already done by the parasite, said in his address to the Californian Fruitgrowers' Convention: 'It is our belief that in a year or two more the codlin moth will not be regarded as a troublesome pest. The one great difficulty was that we could not get grubs in which to breed the parasite. We hope to secure an abundant supply. Then we can breed the parasites through the whole year, and supply all the orchards of apples and pears throughout the State.'

"With the supply of codlin moth grubs from New Zealand the difficulty regarding the food supply of the parasite should be overcome, and we can look forward to the time when the parasite can hunt for its own food in New Zealand, and clean our orchards in this pursuit."

WHAT ROOTS DO.

THEIR FUNCTION AND IMPORTANCE TO THE PLANT.

The following paper was a regular exercise in botany proposed by Eizo Koudo—which sounds like a Japanese name—a first year student at the California Polytechnic School at San Luis Obispo. It is, of course, only a summary of what the student found in his books, but it is not every one who can make such a clear and compact statement. It gives the main facts about the root and what it does, and there are very few farmers who will not be greatly benefited by reading it. Incidentally it gives an idea what students learn at an agricultural school. Whoever will read this carefully, looking up in the dictionary the words whose meaning he is not sure of, will be pretty sure to learn many things which he did not know before.

Hidden at the bottom, like the engine in the hold of a steamer, the root is a most important organ of the plant life. The functions are threefold, as a rule. It anchors the plant to the soil, it absorbs the nutriments for the plant life from the soil, and it serves in many cases as a storehouse of food for the future use of the plant. The firmness of plants in the ground depends upon the nature of their roots, though the depth and character of the soil, to a certain degree, influence the extent of the roots and the tenacity of their hold. The roots of the maize in a rich, tenacious soil, for instance, extend but two or three feet, while those in a light, sandy earth have been traced to a depth of fifteen feet. In general those plants which are exposed to much stress of weather have large and strong roots. Thus tall trees and herbs are fastened to the ground by an elaborate root system, while those whose circumstances do not require such have but few slender roots.

All the underground roots may be divided into two classes. The dycotyledonous plants or exogens have at first a single descending axis—the tap root—from which in most cases the lateral or secondary roots branch out in all directions. The order of their branching is more irregular in older plants than in younger ones, owing to the mechanical hindrances of the soil. This mode of growth beginning with one main root is called the axial mode. The monocotyledonous plants or endogens have no single axis, but produce what are called crown roots or fibrous roots, whose mode of growth is monaxial or radial; that is, they radiate in all directions from the base of the stem. This distinction has important bearings in agriculture, for the roots belonging to the first kind draw their plant food from the lower strata of the soil, while those of the second class spread near the surface and consequently are more dependent upon the external conditions.

Before describing the most important functions of roots—absorption—it is necessary to consider their structure. The root is composed of four parts—the epidermis, the outer covering for protection against harm and reabsorption of the sap by the soil; the cortex, or the soft layer beneath the vascular cylinder; the hard, woody axis running through the centre, and the medullary rays, which are fine silvery lines radiating from the centre. Besides, the tip or root hair is termed the spongiole, from its texture. This important section is well protected by the root cap, consisting of cells that have been

loosened from the main structure, and thus serve merely as an elastic cushion to defend the true termination of the root.

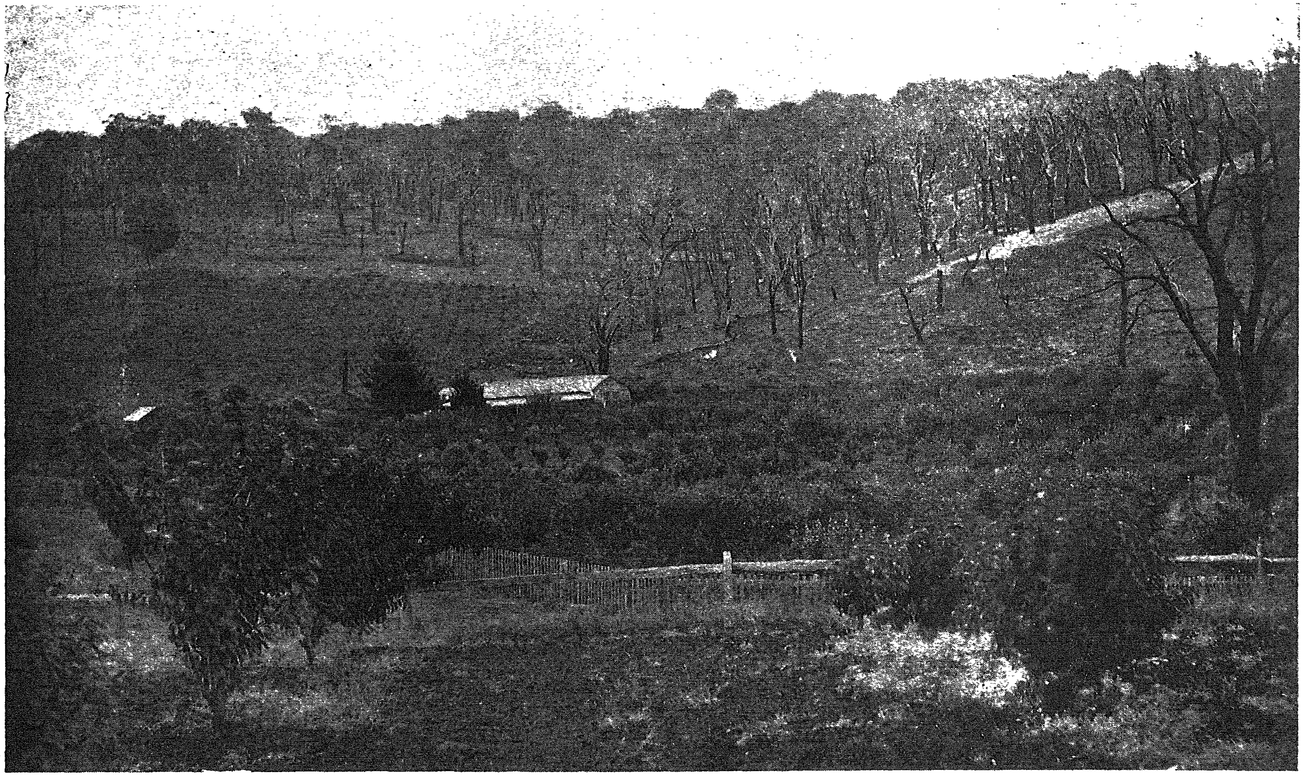
The growth of the root is mostly in length, but very little in thickness. Wigand, in an experiment, divided the young root of a sprouted pea into four equal parts, by ink marks, and after three days he discovered that the two upper divisions had scarcely lengthened, while the third was double and the fourth was eight times its previous length. This is the reason that a root cut off in transplanting never afterward extends in length. The quantity of roots actually belonging to any plant is usually far greater than can be estimated by roughly lifting them from the soil. A conservative estimate of four well-developed corn plants gave an aggregate length of over a mile of roots, not counting the root hairs. The entire root system of a squash vine was found by actual measurement to be over 15 miles in length, not considering the root hairs, and of this length the major part must have been produced at the rate of 1,000 feet per day. (Osterhout.) The quantity of roots in per cent. of the entire plant in the dry state was found to be as follows:—

	Per cent.
Winter wheat, examined last of April	40
Winter wheat, examined last of May	22
Winter rye, examined last of April	34
Peas, examined four weeks after sowing	44
Peas, examined at time of blossom	24

Now, the imbibing the nourishment from the soil is of the utmost importance to plant life. The root, however, is ingeniously fitted for this work. The root hairs, which are exceedingly minute and delicate and cover the young portions of the root system, absorb by osmosis the plant food very dilutely dissolved in water. The raw sap thus imbibed from the soil is carried upward by the root pressure and capillarity through the vascular cylinders of the various portions of the plant to the leaves—the starch factory; then a portion of the manufactured food is carried back to the roots for their growth, and often for storing it for future use. It would almost appear that the root is endowed with instinct in its search for food. From the very beginning of their development, strenuously fighting against obstacles, groping around with numerous rootlets, penetrating through chasms, undermining rocks, they go down day and night until they strike their goal, the plant food. Their spread also, as a rule, corresponds to that of the branches, so that they may drink every drip of rain and dew falling from their own mother plant.

Now, for the majority of the biennials and for some of the perennials, the roots serve as the storehouses of the plant food. This is one of so many wonders performed by nature. Plants like the dahlia and hawkweed perish above ground in winter, being unable to withstand the frost and cold, but survive underground through the supply of nourishment stored in their roots, so that they may start afresh in spring with all the advantages over their less prepared competitors in the never ceasing struggle for existence and reproduction. Again, the hardy winter herbs, such as the plantain, dandelion and common dock, which keep a rosette of green leaves above ground throughout the winter, are supplied with more or less fleshy roots full of nutriment.

The soil is not the only medium for roots to live in, though it is the most proper and common one. Many plants are living in water fed and supported by the aquatic or water roots, which may be easily distinguished



Mr. G. Hester's Homestead, Dalgarrup Park, Blackwood

from the subterranean roots through their white, thread-like, tender and succulent texture. The parasites have a sort of roots known as hanstoria, a term meaning suckers or absorbents, for they draw sap, either raw or digested, from their hosts for their own use. The aerial roots are those which have no concern in the soil, nor are dependent upon other plants—except, perhaps, for anchorage, as the orchid—but acquire the plant food and moisture from the atmosphere. Often, however, they serve as merely the climbing roots, as in the case of the poison ivy or the trumpet vine. The adventitious roots occur on the stems, as those which appear at the lower nodes of corn. They serve to firm the plant in the soil, as well as to perform the other functions of ordinary roots. Most plants are, fortunately, able to produce adventitious roots when they are covered or kept in contact with the ground, thus making their propagation by cuttings and layers possible.

Hastily, by way of conclusion, the root may be defined as a body of tissues provided with vascular bundles, which originate from an older, previously existing part of the plant; its growth is not limited and it never directly gives rise to a leaf.

A MODEL DAIRY FARM AT BALRUDDERY.

1,200 POUNDS OF BUTTER A-WEEK.

From the number of complaints which are being made constantly that foreigners are capturing the markets for dairy produce in Britain, people may be led to the conclusion that our dairy farmers do not know their business. Such an impression is dispelled by personal investigation. It is true, no doubt, that larger quantities of milk and butter might be produced in this country, but that is a different question altogether.

If anyone believes that butter-making to-day is conducted on antiquated lines he may be advised to visit Huntly Farm, on the Balruddery Estate, near Dundee, of which Mr. A. R. Millar is the enterprising tenant. The adjoining farm of Flocklones is also in Mr. Millar's lands, and along with 120 head of other stock, the two farms carry about 160 dairy cows, almost all of the Ayrshire breed. As Mr. Millar's weekly output of butter, taking the year all round, is about 1,200lbs., and as two gallons of milk are required to produced 1lb. of butter, it is apparent that from 125,000 to 130,000 gallons of milk must be handled at Huntly Farm in the course of a twelve-month.

Let us suppose that we have arrived in time for milking operations in the evening. From an engine and suction-pump pipes are led throughout the byres over the backs of the cows, and to these, by means of flexible tubes, are attached pulpitating mechanical milkers. These milkers not only do not give any pain or inconvenience to the cows, but some animals which

are restive when being milked by the hand present a gratified demeanour when the mechanical apparatus is used. A drawing power of 16lbs. to the square inch is applied, and if by any chance that should be exceeded a safety valve at once intervenes. The attendants are also able to watch the progress of the milking through glasses inserted in the tubes which carry the milk from the cows. As there is not any opening between the teats of the cow and the closely-covered vessel into which the milk is conveyed it is kept perfectly free from dust or any other extraneous substances. With the mechanical milkers the whole herd of 160 cows is milked by three or four people in about an hour and a-half.

While the milking has been proceeding the engine has also been driving an immense churn containing 150 or 160 gallons of milk. As both processes—the milking and the churn—are completed almost simultaneously, the observant visitor realises that Mr. Millar has all his work thoroughly organised. Thus, just as preparations are being made to remove the golden-coloured butter from the churn, a worker brings in the first of the milkers to be washed and purified for the morning's work. After being removed from the churn, the butter is thoroughly "worked" to expel every particle of butter milk, and it is then made up in the beautiful half-pound circular blocks with the Huntly Farm imprint, which are familiar in many dairy shop windows in Dundee and district. The local demand for Huntly Farm butter extends for many miles, and the parcel post also conveys regular supplies to families as far distant as London. Mr. Millar supplies about 8,000 gallons of buttermilk yearly to the prison authorities in Dundee, and finds ample outlet for the rest among the bakers of the locality.

It is noteworthy that all the cows are given warm food twice a day. At 5 o'clock in the morning, before they are milked, they receive a mixture of dried grains, molascuit, Bibby meal, and bean meal, which has been steeped for 12 hours, and which is served at a temperature of 90 degrees; in the forenoon each cow is given half a cwt. of turnips and a quantity of hay; in the afternoon 4lbs. of composition cake is served out; and about 4 o'clock another warm feed similar to that of the morning. Straw is supplied in the intervals between the principal meals. To keep up this bill of fare all the year round runs up a series of very heavy bills, and it is this part of the industry, it is needless to say, which Mr. Millar finds the least satisfactory.

While the cows at Huntly Farm are Ayrshires, the bulls are Aberdeen-Angus, from Corston and Burn of Edzell, and for the cross calves which he thus obtains Mr. Millar is able to obtain an average price of 50s. He rears about 40 heifers for commercial purposes, and also keeps a number of Highland cattle and a flock of sheep. It is interesting to learn, too, that Mr. Millar has just arranged a new lease of his farms, and in this connection all his friends will wish for him even greater success and satisfaction throughout its currency than he has enjoyed during the 26 years which he has spent as tenant, along with his father and on his own behalf, at Huntly and Flocklones.—*People's Journal.*

RICH MILK.

Just now some of our English exchanges are wrestling with the question of who is to blame if the cow gives milk below the legal standard of 3 per cent. fat. One paper declares that it is an act of Providence, beyond the action or reach of law, and that the owner cannot be proceeded against for selling such inferior milk. It occurs to *Hoard's Dairyman* that a little plain common sense is needed here. The law defines legal or merchantable milk, both as to its fat content and its cleanliness and purity. It says nothing as to the agency whereby these conditions may be lowered. Merchantable milk must contain not less than 3 per cent. fat.

If the owner takes milk to market which runs below this standard, he is responsible, no matter whether he has cows which dilute it or he dilutes it himself. The law does not, nor can it, deal with the cow. It is the owner or seller who is responsible. Some of the writers claim it is because of deficient feeding that these cows give poor milk. In this they show they are not well informed in the philosophy of milk production. It seems to be a very hard matter to convince even some very well posted men that it is an individual or breed force and not a feed force that creates rich milk or lean milk. Certain cows in all breeds give rich milk, no matter on what they are fed. Feed them well, and they will give more of it; feed them poorly, they will give less; but the proportion of fat to other solids is fixed in the nature of the cow herself. Then again, there are certain breeds of cows, like Jerseys and Guernseys, that give, on the average, richer milk than other breeds. Occasionally we will find a cow in these breeds who gives poor, lean milk. The fact is unexplainable.

The way to increase the richness of milk is to breed for it; there is no other way. The way to induce a larger flow of milk immediately is to bestow thought, care, and feed on the cow. See to it that all the conditions which surround her, such as food, drink, shelter, air, and personal contact, are of a character that will promote her comfort. If you do that, you will help her to do the best she can. But back of all this lies the force and agency of breeding. Right breeding will influence both the quantity and quality of milk.

If men have cows that give poor milk, they should either sell them or else they should separate part of the milk and add the cream to the balance, or they should add enough cows giving rich milk to bring the whole up to a legal standard. But the man who puts on the market a milk below the legal standard is responsible before the law for that act, and not the cows.

Slowly but surely the light is breaking into the minds of men that this cow question, with its relation to human food, as well as a promoter of disease, its lines and limitations on the farm, and its vast importance commercially, is a question that requires profound study and the broadest understanding at every step of the way.—*Hoard's Dairyman.*

GARDEN NOTES FOR JUNE.

By Percy G. Wicken.

The month of May, in which these notes have to be written, started well, the rain coming in on the first of the month promised to start into growth the seeds which had in many instances been waiting in the ground for some time for sufficient moisture to cause them to germinate. The early rain was only partial, but where it fell in sufficient quantities young plants under the favourable conditions of heat and moisture should make rapid growth. When the dry season has once broken up further falls of rain may be expected, while the heavy dews which fall every night help to keep the vegetation green. If the land has been deeply dug, and properly prepared, as so often mentioned in these notes, the ground will soak in every drop of moisture, and if well drained the surplus supply will soon soak away, leaving the soil nicely saturated without any surplus water to become stagnant; under such favourable conditions vegetables should grow to perfection. In preparing beds for vegetables special attention should be paid to drainage: so many failures are due to deficient drainage and the effects of stagnant water on the roots of plants. If it is not practical to sub-drain the land, deep surface drains should be constructed, and the land well ridged up so as to run off as much of the surplus water as possible. Next in importance to drainage is the question of fertilising. Some plants, such as cabbages and cauliflowers, are gross feeders, and require liberal applications of nitrogenous fertilisers in a soluble form, other plants require similar fertilisers in less soluble forms; plants of the leguminose order do not require nitrogenous fertilisers, but benefit from superphosphate and potash. Some of the root crops are better without fresh manure, and do better when following on a crop that has been heavily manured the following season. Potatoes require a liberal application of a complete fertiliser, while mangel wurzels benefit by the addition of salt to a complete fertiliser, and can stand a salt soil. Highly soluble fertilisers should not be applied until the plant is sufficiently grown to be able to make use of them, otherwise they may be washed out of soil, and no benefit derived from their application.

Artichokes (Globe) may be planted out any time now, or a little later on in the spring. Either suckers from old plants or rooted plants may be used. If the soil is good, and has been well manured, they should be planted three feet apart each way. If soil is poor, and they are not likely to make such good growth, they may be planted closer.

Asparagus.—If the trench for spring planting has not been already prepared, it should be done at once, and a liberal supply of well-rotted stable manure dug into the soil.

Beans (Broad) should now be growing well, and in the warmer districts will be bearing. A further supply may be sown during the month. Rows three feet apart and about 12 inces apart in the rows. Sow two seeds in each place and thin out to single plant.

CABBAGE.—All strong healthy plants should be planted out as soon as possible, care should be taken to spread the roots out the same as they were in the seed bed; if planted so that the roots become doubled up the plants never make a satisfactory growth afterwards.

CAULIFLOWERS are becoming plentiful from the market gardens in the city, but where water cannot be obtained for garden purposes, young plants cannot be put out before the autumn rains commence, consequently as many plants as required should be raised and planted out on the first opportunity.

CARROTS.—Those already up should be thinned out and kept free from weeds. A few more rows may be sown for future use.

CELERY.—Plant out in trenches all young plants that are ready; those that are now growing should be earthed up to cause the stalks to bleach, but care should be taken that no earth gets into the heart of the plant.

LEEK.—Plant out all the seedlings you have and sow as upply of seed for future use. As soon as the plants have grown to a little over six inches in height they should be planted out in shallow trenches, first trimming off the roots and cutting back the leaves.

LETTUCE.—Plant out seed for future use, and set out in beds all the plants that are available.

ONIONS.—Plant out in well cultivated and heavily manured ground all the young plants available. Put plants in drills from 12 to 15 inches apart and from four to six inches apart in the drills.

PEAS.—Pull up all old plants that have ceased bearing; plant out a fresh supply of seed. This plant can be sown largely, as there is always a demand for this vegetable.

TURNIPS.—Thin out and weed those already up. Sow a further supply to keep up a succession. Swede as well as white turnips should be sown. Sow in drills 30 to 36 inches apart, and thin out when the plants come up to 15 inches apart in the drills. Swede turnips take longer to grow than white turnips, but are of a much higher value for food.

FARM.—May and June are busy months on the farm, and as this is a somewhat late season many will not have completed their sowing until June. All seeding operations should be completed, if possible, by the end of May, but if this is not possible, quick-growing varieties of wheat should be sown at the later date. Settlers who have fallow land will no doubt have finished their sowing before this, and their teams will be busily engaged in fallowing land for next season. Many settlers have had to wait for rain before they have been able to plough their land, and as the rain was late in coming, these settlers will have to use every endeavour to push on with their work so as to get as much as possible done before the ground becomes too wet.

Many inquiries are made about grasses, and the Department has arranged for a number of blocks, ranging from one and a half to five acres, to be planted in various districts for experimental purposes. Deep-rooted grasses are being especially tried, as they are more likely to stand the dry weather than the more shallow-rooted ones. Grass seeds require to be sown lightly on the surface of ground which has been well prepared and brought to a fine state of tilth. Laying down permanent pasture is a somewhat expensive business, the grass seed costing from 30s. to 50s. per acre according to the variety used; consequently to prevent a failure of the crop it is desirable to give special attention to the cultivation of the land. A good

way in which a pasture may be formed is to sow a quantity of grass seed with the grain sown for a hay crop. When the hay crop is taken off the grass will, under favourable circumstances, make a good growth and afford an excellent pasture for fattening sheep. Lucerne has also been successfully grown under these conditions.

Rape is one of the best sheep fodders obtainable, and a small area should be sown by all sheep farmers. The seed is very cheap, costing only a few pence per pound. The plant grows quickly and stands well into the summer, and is excellent for fattening lambs.

Rape, lucerne, and spring grass seeds should all be sown during May or early in June, according to locality. If not sown during this period in the colder districts, they are better left until about August before sowing.

LOCAL MARKETS' REPORTS.

W.A. GENERAL PRODUCE COMPANY'S REPORT.

Market report of the W.A. General Produce Company, 245 Murray-street, Perth, for the week ending Wednesday, 2nd May, 1906 :—

Business during the past week fairly active; supplies irregular, and values likewise; detail particulars as follows:—Bacon continues selling well; values remain firm. Hams: Better supplies; selling very well. Butter: Fair supplies; large sales; values hardening, f.o.b., Melbourne; if cold sets in, material rise will take place. Cheese: Regular; good demand; values a little higher, with further expectations of a rise. Eggs: New laid in great demand, also fresh country lots sell readily at quotations. Potatoes: Freshly-dug lots selling at high prices; imported of good quality rather scarce. Onions: Values, f.o.b., Melbourne, advanced somewhat on spot; fair supplies selling well. Chaff: Supplies coming forward; not equal to the demand: values remain firm. Vegetables: Good cabbage still scarce; small goods more plentiful. Poultry: Fleshy young cockerels for killing in good demand; also many inquiries for young laying hens; aged roosters and hens hard to sell. Carcase pork sells well if cleanly dressed and in good condition.

Farm and Dairy Produce.—Bacon: Hutton's, 9¼d. to 9½d. per lb.; Newnham's, 8¾d. per lb.; others worth 7d. per lb. Hams: Hutton's, 1s. 1d. per lb.; others, 9d. to 1s. per lb. Butter: Euroa, 1s. 1d. per lb.; Millawa, 12¾d. per lb.; Hansen, 12½d. per lb. Lard, in bladders, 7½d. per lb. Cheese: Loaf, 8½d. per lb.; medium, 7¾d. per lb. Eggs: Local new laid, 2s. 6d. to 3s. per doz.; country lots, 2s. to 2s. 4d. per doz. Potatoes: Local, new, 10s. to 16s. 6d.; Tasmanians, £9 to £12 per ton; seed, 12s. to 16s. per cwt. Onions, 9s. per cwt. Chaff: Prime green, £4 12s. 6d. to £4 15s; medium, £3 15s. to £4 5s. Bran and Pollard, £5 15s. to £6 7s. 6d. per ton. Flour: Peerless and Premier, £8 10s. to £8 15s. per ton; Eureka and Thomas', £8 15s. to £9 per ton. Oats: New Zealand, 3s. to 4s. 2d. per bushel; Algerian, 3s. to 3s. 2d. per bushel. Wheat: Truck lots, 3s. 3d. to 3s. 9d. per bushel. Oil Cake: Sunlight, £9 10s. per ton.

Fruit.—Oranges: Italian, 25s. to 27s. 6d. per case; local, naval, 11s. to 15s. per case. Lemons: Italian, 26s. per case; local, 7s. 6d. to 10s. per case. Apples: Well-coloured varieties, 8s. to 12s. 6d. per case; medium, 6s. 6d. to 9s. per case; cooking,

3s. 6d. to 7s. per case. Pears: Pure dessert, 10s. to 14s. 6d.; medium, 7s. to 9s.; cooking, 3s. 6d. to 5s. per case. Quinces, 3s. 6d. to 4s. 9d. per case.

Vegetables.—Cabbage, 9s. to 14s. per cwt. Carrots, 1d. to 1s. 8d. per doz. Parsnips. 1s. to 1s. 9d. per doz. Turnips, white, 9d. to 2s. per doz. Swedes, 1s. 6d. to 2s. 6d. per dozen bunches. Beans, French, 1½d. to 3d. per lb. Peas, green, 4d. per lb. Marrows, 1s. 6d. to 3s. 6d. per dozen. Pumpkins, ironbark, 4s. 6d. to 6s. 6d. per cwt.; bugles, 4s. to 4s. 6d. per cwt. Rhubarb, 1d. to 2½d. per lb.

Salads and Herbs.—Lettuce, 1s. to 2s. 6d. per quarter bag. Spring onions, 3d. to 6d. per bundle. Beetroot, 1s. to 1s. 6d. per doz. Cucumbers, 10d. to 2s. 6d. per dozen. Tomatoes, prime green, 4s. to 8s. 6d.; others, 3s. to 5s. 6d. Celery, 6d. to 3s. per dozen heads. Raddishes, 3d. to 8d. per dozen bunches. Thyme, marjorum, and sage, 1s. 6d. per dozen bunches. Mint, 4d. per bundle. Parsley, 6d. per bundle.

Poultry (for killing).—Young laying pullets, 5s. 6d. to 6s. 6d. per pair; prime cockerels, for killing, 5s. to 6s. 9d. per pair. Hens and roosters, 3s. 6d. to 4s. 6d. per pair. Chickens, 2s. 6d. to 3s. 6d. per pair. Ducks, 4s. to 5s. 6d. per pair. Geese, worth 7s. to 9s. per pair. Turkeys: Gobblers, 12s. to 18s. per pair; hens, 6s. to 8s. 6d. per pair.

Carcase Meat.—Pork: Carcase medium size, 4½d. to 5½d. per lb.

Sundries.—Corn sacks, secondhand, 4s. 6d. per dozen. Bran bags, secondhand, 3s. 3d. per dozen. Bonedust, £7 10s. per ton. Bonemeal, £8 per ton. Phosphate, £4 5s. per ton. Superphosphate, £5 10s. per ton. Guano, ammonical, £4 10s. per ton. Kainit, £4 15s. per ton. Nitate of superphosphate, £6 10s. per ton. Special vegetable manure, £7 per ton. Potato, onion, and other root crops manure, £7 10s. Thomas' phosphates (English grades), £4 5s. per ton. Nitro-superphosphate, £6 10s. per ton.

MESSRS. H. J. WIGMORE & Co.'s REPORT.

H. J. Wigmore & Co., of Fremantle, Perth, Kalgoorlie, and Northam, report as follows in connection with their daily auction sales of chaff and grain at Perth and Fremantle railway yards for month ending Tuesday, 8th inst.:—

Chaff.—As we anticipated in our last monthly report, the arrivals of chaff during this month have been light, and as a consequence the market has firmed and improved considerably. The quality of chaff coming forward, however, as a rule, has been distinctly inferior (this doubtless being due to the fact that most of the better qualities are being railed from the different agricultural centres to Kalgoorlie, which, of course, is only natural, as that market offers a higher relative figure than Perth for prime samples), and we have no doubt that for anything approaching prime wheaten £5 could be readily obtained at auction. Indeed, we have to report considerable sales *ex* store of only f.a.q. wheaten chaff at £5 to £5 5s. per ton. Oaten chaff also commands a good market, and we sold a truck of this description, f.a.q., at yesterday's sales at £5 per ton, this being the highest price obtained at auction this season for either oaten or wheaten chaff. We quote closing values as follow:—Prime green wheaten (none to hand), £5 and possibly £5 2s. 6d.; f.a.q. wheaten (very scarce), £4 17s. 6d. to £5; good medium wheaten, £4 12s. 6d. to £4 15s.; medium wheaten, £4 10s. to £4 12s. 6d.; inferior and cow chaff, £3 12s. 6d. upwards; prime oaten, £5; f.a.q. oaten, £4 15s. to £4 17s. 6d.; medium oaten, £4 5s. upwards. At Kalgoorlie we have repeatedly sold during the last fortnight prime wheaten at £6 and £6 2s. 6d. The future of the market at the present moment has a somewhat more cheerful outlook, as South Australia has increased her price by 5s. per ton. This simply means that an equivalent increase here may reasonably be expected. We still maintain our opinion that extreme prices cannot fairly be expected. If a further rise occur in South Australia, an equivalent can certainly be looked for here. Possibly on present outlook, and until farmers have finished their seeding operations, we may reasonably anticipate that £5 10s. will be seen in Perth for prime stuff. Those farmers who can possibly forward to auction cannot do better than send along to us now. Doubtless the winter rains will also interfere with arrivals, and consequently enhance values. We have to report heavy private sales made by us during last week on rails from different country centres, including Northam, Waeel, Cunderdin, Kellerberrin, and Meckering.

Wheat has firmed still further in the Eastern States, and f.a.q. shipping parcels may now be quoted at 3s. 4d. to 3s. 4½d., f.o.b., Port Adelaide or Melbourne. On spot we have no alteration to record, and value for prime milling remains at about 3s. 8½d.; pinched inferior and smutty samples according to condition.

Oats.—Algerians have risen in Melbourne, and Good Feeds are now quoted at 2s. 4d. upwards, f.o.b. On spot we have sold heavily whole Algerians, Good Feed, at 2s. 8d., and crushed at 2s. 9d. Tasmanian Stouts were practically unprocurable last week, which enabled New Zealand to come in, and we made heavy sales, f.o.b., N.Z., at 2s. 1d. New Zealands have since risen to 2s. 2d.

Flour.—As predicted, we have to report a higher price for Messrs. Thomas & Co.'s Adelaide "Standard," quote now being £7 10s. sacks; £7 15s. ¼s., f.o.b., Port Adelaide. Northam "Standard" we continue to quote at £8 sacks, £8 5s. ¼s. on rails there. Bakers, however, would do well to communicate with us at once, as there is little doubt that a rise will occur in the near future.

Bran and Pollard firmer. We have made considerable sales of bran and pollard f.o.b.. Sydney, at 10¾d. Melbourne cannot quote except at prohibitive rates. Adelaide, which is now the cheapest market when freight is considered, quotes at 11½d. for both bran and pollard. On spot we have sold at £6.

Straw.—Now worth £2 17s. 6d. to £3 at auction in Perth. We have done good business at these rates. This commodity should see higher prices in the near future on account of its extreme scarcity.

Bran Bags have made a considerable rise. We are well placed, and invite correspondence from farmers requiring.

THE CLIMATE OF WESTERN AUSTRALIA DURING APRIL, 1906.

This month was very hot throughout the State, every station recording a mean maximum considerably in excess of that for previous years. This excess amounted to nearly 10° at Nullagine. At the Observatory, the mean maximum (80·2) was the highest yet recorded.

There was a record spell of hot weather at the commencement and again at the end of the month. In the former case we had four successive days over 90° and in the latter 7 over 80°. The summer broke on the night of April 30th, when the first winter rains occurred. There had previously been a moderate downpour in S.W. districts on the 19th and 20th, but this was not actually the commencement of the winter.

The mean atmospheric pressure was about, or slightly below, the average for previous years.

The total rainfall was very light throughout the State, and far below the normal.

The first sign of frosty weather occurred on the 22nd, when the temperature of the surface of the ground fell to 28° at Katanning.

W. E. COOKE,
Government Astronomer.

9th May, 1906.

The Climate of Western Australia during April, 1906.

	Locality.	Barometer (corrected and reduced to sea-level).				Shade Temperatures.									Rainfall.		
						April, 1906.					* Average for previous Years.						
		Mean of 9 a.m. and 3 p.m.	Average for previous years.	Highest for Month.	Lowest for Month.	Mean Max.	Mean Min.	Mean of Month.	Highest Max.	Lowest Min.	Mean Max.	Mean Min.	Highest ever recorded.	Lowest ever recorded.	Points (100 to inch) in Month.	Wet Days.	Total Points since Jan. 1.
North-West and North Coast:	Wyndham	29·903	29·907	30·038	29·780	97·3	81·8	89·6	102·0	75·1	95·0	77·3	103·2	63·5	16	1	1,383
	Derby	29·904	29·917	30·025	29·790	98·4	72·6	87·3	105·2	65·0	95·7	70·9	103·2	55·0	14	1	1,017
	Broome	29·900	29·924	30·006	29·768	96·4	76·5	86·4	106·2	66·6	93·8	71·6	102·4	56·0	16	2	961
	Condon	29·908	29·945	30·054	29·741	95·6	70·5	83·0	110·8	63·8	90·1	66·3	103·0	46·0	*Nil*	...	220
	Cossack	29·908	29·954	30·040	29·762	98·3	73·0	85·6	109·0	68·0	91·2	70·2	105·0	59·7	*Nil*	...	105
	Onslow	29·935	29·950	30·076	29·826	99·3	69·3	84·3	111·0	64·2	92·0	67·5	105·0	53·0	*Nil*	...	91
	Winning Pool ...	29·936	...	30·047	29·822	99·3	66·3	82·8	107·2	59·6	...	...	...	...	*Nil*	...	73
	Carnarvon	29·995	29·992	30·110	29·863	86·6	66·1	76·4	102·4	57·2	82·9	64·0	108·0	46·0	*Nil*	...	30
	Hamelin Pool... ...	30·001	30·004	30·146	29·880	89·6	62·7	76·2	102·4	51·0	85·6	61·6	105·6	50·0	2	1	2
	Geraldton	30·032	30·052	30·232	29·921	83·1	61·2	72·2	98·6	53·8	78·1	59·3	99·4	41·8	24	1	64
Inland:	Hall's Creek	29·978	29·968	30·118	29·765	97·4	69·0	83·2	103·8	53·0	91·5	63·3	102·0	47·0	*Nil*	...	395
	Marble Bar	...	...	...	...	103·5	74·5	89·0	111·5	67·0	96·4	68·0	106·0	50·0	31	2	484
	Nullagine	29·944	29·950	30·119	29·756	99·7	65·2	82·4	108·0	52·0	90·1	61·7	99·8	41·0	20	1	497
	Peak Hill	29·970	29·986	30·160	29·760	93·0	66·0	79·5	105·0	54·0	83·5	61·5	95·8	48·8	*Nil*	...	22
	Wiluna	29·984	30·003	30·230	29·732	89·0	59·8	74·4	101·0	45·0	84·9	56·2	99·4	39·5	*Nil*	...	266
	Cue	30·025	30·034	30·213	29·778	88·6	61·5	75·0	101·0	47·0	84·5	59·8	101·0	41·0	*Nil*	...	124
	Murgoo	...	...	...	...	90·0	61·2	75·6	102·0	46·0	...	...	...	...	*Nil*	...	18
	Yalgoo	30·000	30·038	30·223	29·694	87·1	61·4	74·2	102·2	44·0	83·4	58·1	102·5	42·3	10	2	59
	Lawlers	30·024	30·050	30·270	29·780	87·5	61·3	74·4	100·6	48·8	81·0	58·0	98·1	39·4	*Nil*	...	338
	Laverton	30·048	30·069	30·324	29·742	86·1	59·8	73·0	100·7	47·4	82·0	56·4	96·9	38·6	*Nil*	...	339
	Menzies	30·074	30·077	30·288	29·767	84·6	58·1	71·4	100·5	42·0	78·4	56·0	98·0	37·0	*Nil*	...	296
	Kanowna	...	...	...	...	82·2	53·4	67·8	100·0	41·2	...	...	...	...	*Nil*	...	161
	Kalgoorlie	30·078	30·098	30·370	29·742	83·3	56·1	69·7	101·4	39·8	77·3	54·7	96·2	38·8	*Nil*	...	88
	Coolgardie	30·068	30·092	30·370	29·750	81·9	54·3	68·1	101·0	39·8	77·1	53·8	97·8	38·1	*Nil*	...	134
	Southern Cross ...	30·070	30·072	30·350	29·730	84·0	52·0	68·0	101·0	33·0	78·3	51·4	98·0	31·7	5	1	106
	Kellerberrin	...	...	...	...	...	...	...	...	...	...	...	...	...	9	1	74
	Walebing *	...	...	...	...	83·2	51·9	67·6	101·0	44·0	78·6	51·9	95·7	37·4	29	3	201
	Northam *	...	...	...	...	83·3	51·3	67·3	102·0	37·2	79·2	51·0	92·6	37·4	14	2	44
	York	30·086	30·096	30·317	29·793	82·6	51·3	67·0	102·0	38·0	78·0	51·2	100·2	34·5	19	2	41
	Guildford	...	...	...	...	83·1	55·2	69·2	100·1	42·0	79·2	53·4	96·4	36·5	42	3	148

The Climate of Western Australia during April, 1906—*continued.*

Locality.	Barometer (corrected and reduced to sea-level).				Shade Temperatures.									Rainfall.		
					April, 1906.					Average for previous Years.						
	Mean of 9 a.m. and 3 p.m.	Average for previous years.	Highest for Month.	Lowest for Month.	Mean Max.	Mean Min.	Mean of Month.	Highest Max.	Lowest Min.	Mean Max.	Mean Min.	Highest ever recorded.	Lowest ever recorded.	Points (100 to inch) in Month.	Wet Days.	Total Points since Jan. 1.
South-West and South Coast:																
Perth Gardens	...	30·106	30·376	29·697	79·1	58·1	68·6	96·0	45·6	77·1	54·8	99·0	41·0	44	4	232
Perth Observatory ...	30·112	30·097	30·371	29·703	80·2	58.6	69·4	98·0	46·3	75·0	56·4	97·4	42·4	54	3	213
Fremantle	30·104	30·092	30·391	29·819	76·6	61·4	69·0	93·0	52·2	73·2	58·4	93·6	46·4	19	5	97
Rottnest	30·108	30·069	30·367	29·789	75·6	62·5	69·0	92·0	53·0	72·0	60·1	91·0	47·8	21	3	70
Mandurah	...	...	...	...	78·5	53·2	65·8	92·2	40·0	75·5	52·2	93·4	36·8	43	3	200
Marradong	...	...	...	...	...	...	...	...	...	...	...	...	...	62	2	168
Wandering	...	...	...	...	78·7	4·67	62·4	96·2	33·5	...	...	...	...	44	2	111
Narrogin	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
Collie	...	...	...	...	78·2	46·3	62·2	91·0	33·0	72·9	43·9	89·1	29·6	112	4	315
Donnybrook	...	...	...	...	77·1	51·3	64·2	93·5	39·3	73·5	48·4	86·7	33·4	134	4	391
Bunbury	30·090	30·106	30·350	29·770	75·0	55·0	65·0	84·0	42·0	73·0	52·7	89·5	36·7	57	4	241
Busselton	...	...	...	...	75·0	50·7	62·8	86·0	38·0	72·0	49·6	87·3	32·2	53	6	187
Cape Naturaliste ...	30·072	...	30·340	29·679	70·0	58·0	64·0	80·0	48·0	...	...	...	...	73	6	282
Bridgetown	...	...	...	...	77·3	45·9	61·6	91·0	34·2	73·0	44·4	90·0	29·5	29	4	275
Karridale	30·075	30·110	30·350	29·620	75·0	54·0	64·5	86·0	42·0	70·4	51·9	92·0	36·6	128	7	477
Cape Leeuwin	30·050	30·070	30·350	29·400	71·0	61·0	66·0	84·0	53·0	68·9	58·8	89·5	49·0	109	11	174
Katanning	30·065	30·098	30·370	29·660	78·0	51·0	64·5	96·0	36·0	72·0	48·4	96·2	33·0	33	4	232
Mt. Barker	...	...	...	...	69·5	50·8	60·2	90·3	32·5	...	...	...	...	70	8	379
Albany	30·077	30·100	30·382	29·571	71·5	54·5	63·0	92·2	39·8	68·7	52·6	98·5	39·5	175	12	474
Breaksea...	30·080	30·102	30·380	29·410	68·0	58·0	63·0	91·0	48·0	66·3	56·0	96·4	44·0	134	16	417
Esperance	30·088	30·116	30·387	29·572	74·6	54·7	64·6	99·0	39·2	72·3	54·3	99·0	40·2	18	3	195
Balladonia	30·102	30·115	30·396	29·582	79·7	49·2	64·4	99·2	37·3	76·6	51·9	103·4	37·6	1	1	113
Eyre	30·076	30·110	30·244	29·532	77·9	51·7	64·8	103·0	39·0	73·6	55·3	100·7	36·8	18	4	267
INTERSTATE.																
Perth	30·112	30·097	30·371	29·703	80·2	58·6	69·4	98·0	46·3	75·0	56·4	97·4	42·4	51	3	213
Adelaide	30·110	30·146	30·390	29·680	72·9	56·2	64·6	87·0	49·0	73·4	54·7	98·0	39·6	88	12	324
Melbourne	30·016	30·025	30·440	29·620	68·5	52·8	60·6	84·2	40·3	68·6	50·6	94·0	34·8	136	...	...
Sydney	30·060	30·103	30·360	29·780	76·0	60·0	68·0	88·0	52·0	70·8	58·2	88·9	44·6	93	...	775

The Observatory, Perth, April, 1906.

W. E. COOKE, Government Astronomer.

RAINFALL for March, 1906 (completed as far as possible), and for April, 1906 (principally from Telegraphic Reports).

Stations.	March.		April.	
	No. of points. 100 = 1in.	No. of wet days.	No. of points. 100 = 1in.	No. of wet days.
East Kimberley:				
Wyndham ...	285	6	16	1
6-Mile	161	6	...	...
Carlton	152	4	...	...
The Stud Station	...	...	...	...
Argyle Downs ...	115	4	...	...
Rosewood Downs	..	...	...	...
Lisadell	...	...	...	...
Turkey Creek ...	70	7	Nil	...
Ord River ...	3	1	...	...
Alice Downs ...	...	...	...	...
Flora Valley ...	...	...	...	...
Hall's Creek ...	15	3	Nil	...
Nicholson Plains	...	...	...	...
Ruby Plains ...	...	...	...	..
Denison Downs	...	...	...	...
West Kimberley:				
Mt. Barnett ...	...	...	...	...
Corvendine ...	...	...	...	...
Leopold Downs...	...	...	...	...
Fitzroy Crossing (P.O.)	Nil	...	3	2
Fitzroy Station ...	...	...	...	...
Quanbun ...	...	...	...	...
Nookanbah ...	...	...	...	...
Upper Liveringa	Nil	...	...	...
Mt. Anderson ...	...	...	...	...
Yeeda	...	...	...	...
Derby	27	1	14	1
Pt. Torment ...	2	1	...	...
Obagama ...	169	3	...	...
Beagle Bay ...	170	2	...	...
Roebuck Downs	...	...	...	...
Kimberley Downs	...	...	...	...
Broome	Nil	...	16	2
Thangoo ...	...	...	...	...
La Grange Bay...	Nil	...	2	1
N.W. Coast:				
Wallal	Nil	...	82	1
Pardoo	Nil	...	...	...
Condon	Nil	...	Nil	...
DeGrey River ...	Nil	...	...	...
Port Hedland ...	113	1	Nil	...
Boodarie ...	...	...	...	...

Stations.	March.		April.	
	No. of points. 100 = 1in.	No. of wet days.	No. of points. 100 = 1in.	No. of wet days.
N.W. Coast—*cont.*				
Balla Balla ...	...	...	...	...
Whim Creek ...	Nil	...	Nil	...
Mallina	Nil	...	...	...
Croydon	4	1	...	...
Sherlock ...	...	...	...	...
Woodbrooke ...	Nil	...	...	...
Cooyapooya ...	...	...	...	...
Roebourne ...	Nil	...	Nil	...
Cossack	Nil	...	Nil	...
Fortescue ...	Nil	...	Nil	...
Mardie	Nil	...	...	...
Chinginarra ...	Nil	...	...	...
Yarraloola ...	Nil	...	...	...
Peedamullah ...	Nil	...	...	...
Onslow	1	1	Nil	...
Point Cloates ...	Nil	...	...	...
N.W. Inland:				
Warrawagine ...	Nil	...	...	...
Eel Creek ...	...	...	...	...
Muccan	Nil	...	...	...
Ettrick	...	...	...	...
Mulgie	Nil	...	...	...
Warralong ...	25	1	...	...
Coongon... ...	...	...	...	...
Talga	...	...	...	...
Bamboo Creek ...	90	1	90	1
Moolyella ...	...	...	...	...
Marble Bar ...	16	1	31	2
Warrawoona ...	Nil	...	Nil	...
Corunna Downs	31	1	...	...
Mt. Edgar ...	...	...	...	...
Nullagine ...	Nil	...	20	1
Middle Creek ...	...	...	...	...
Mosquito Creek	...	...	...	...
Roy Hill... ...	...	...	...	...
Bamboo Springs	...	...	...	...
Kerdiadary ...	...	...	...	...
Woodstock ...	Nil	...	...	...
Yandyarra ...	...	...	...	...
Station Peak ...	36	1	...	...
Mulga Downs ...	Nil	...	...	...
Mt. Florence ...	...	...	...	...
Tambrey ...	Nil	...	...	...
Millstream ...	Nil	...	...	...
Red Hill... ...	...	...	...	...

RAINFALL—*continued.*

Stations.	March.		April.	
	No. of points. 100 = 1in.	No. of wet days.	No. of points. 100 = 1in.	No. of wet days.
N.W. Inland—*cont.*				
Mt. Stewart ...	...	...	...	...
Peake Station ...	...	...	...	...
Nanutarra ...	...	...	...	...
Yanrey	32	1	...	...
Wogoola... ...	...	...	...	...
Towera	...	...	...	...
Gascoyne:				
Winning Pool ...	10	1	Nil	...
Coordalia ...	...	...	...	...
Wandagee ...	...	...	...	...
Williambury ...	Nil	...	...	...
Yanyeareddy ...	...	...	...	...
Maroonah ...	...	...	...	...
Ullawarra ...	...	...	...	...
Mt. Mortimer ...	Nil	...	...	...
Edmunds ...	...	...	...	...
Lyons River ...	12	1	...	...
Minnie Creek ...	...	...	...	...
Gifford Creek ...	...	...	...	...
Bangemall ...	...	...	...	...
Mt. Augustus ...	...	...	...	...
Upper Clifton Downs	...	...	...	...
Clifton Downs ...	...	...	...	...
Dairy Creek ...	Nil	...	...	...
Mearerbundie ...	...	...	...	...
Byro	Nil	...	...	...
Meedo	...	...	...	...
Mungarra ...	...	...	...	...
Bintholya ...	Nil	...	...	...
Booloogooroo ...	...	...	...	...
Doorawarrah ...	Nil	...	...	...
Brick House ...	...	...	...	...
Boolathana ...	Nil	...	...	...
Carnarvon ...	Nil	...	Nil	...
Dirk Hartog ...	...	...	...	...
Shark Bay ...	Nil	...	Nil	...
Wooramel ...	Nil	...	...	...
Hamelin Pool ...	Nil	...	2	1
Kararang ...	...	...	...	...
Tamala	...	...	...	...
Yalgoo District:				
Woolgorong ...	Nil	...	...	...
New Forest ...	...	...	...	...
Yuin	Nil	...	Nil	...
Pindathuna ...	Nil	...	Nil	...

Stations.	March.		April.	
	No. of points. 100 = 1in.	No. of wet days.	No. of points. 100 = 1in.	No. of wet days.
Yalgoo District—*contd.*				
Tallyrang ...	Nil	...	Nil	...
Mullewa ...	2	1	4	1
Kockatea ...	Nil	...	4	1
Barnong ...	Nil	...	15	1
Gullewa	Nil	...	Nil	...
Gullewa House...	Nil	...	13	1
Gabyon	Nil	...	5	1
Mellenbye ...	...	...	...	...
Wearagaminda...	5	1	...	...
Yalgoo	5	1	10	2
Wagga Wagga ...	...	...	...	...
Muralgarra ...	Nil	...	...	...
Burnerbinmah ...	Nil	...	...	...
Nalbara	Nil	...	2	1
Wydgee	Nil	...	...	...
Field's Find ...	Nil	...	...	...
Rothesay ...	...	...	...	...
Ninghan ...	5	1	...	...
129-Mile ...	...	...	...	...
Condingnow ...	Nil	...	...	...
163-Mile ...	Nil	...	...	...
Palaga Rocks ...	8	1	...	...
126-Mile ...	Nil	...	3	1
90-Mile	Nil	...	Nil	...
Mt. Jackson ...	Nil	...	2	1
Murchison:				
Wale	...	...	...	...
Yallalonga ...	Nil	...	...	...
Billabalong ...	Nil	...	...	...
Twin Peaks ...	...	...	...	...
Murgoo	18	1	Nil	...
Mt. Wittenoom...	4	1	...	...
Meka	7	1	...	...
Wooleane ...	Nil	...	...	...
Boolardy ...	...	...	...	...
Woogorong ...	Nil	...	...	...
Manfred ...	Nil	...	...	...
Yarra Yarra ...	...	...	...	...
Milly Milly ...	...	...	...	...
Berringarra ...	Nil	...	...	...
Mileura	Nil	...	...	...
Mt. Gould ...	Nil	...	...	...
Moorarie ...	Nil	...	...	...
Wandary ...	...	...	...	...
Peak Hill ...	Nil	...	Nil	...
Mt. Fraser ...	...	...	...	...
Abbotts	Nil	...	Nil	...
Belele	Nil	...	...	...

RAINFALL—*continued.*

Stations.	March. No. of points. 100 = 1in.	March. No. of wet days.	April. No. of points. 100 = 1in.	April. No. of wet days.
MURCHISON—*contd.*				
Meekatharra ...	...	...	...	...
Star of the East	Nil	...	Nil	...
Nannine	Nil	...	Nil	...
Annean	14	2	...	...
Tuckanarra ...	Nil	...	...	...
Coodardy ...	Nil	...	...	...
Cue	Nil	...	Nil	...
Day Dawn ...	2	1	Nil	...
Lake Austin ...	Nil	...	Nil	...
Lennonville ...	7	2	Nil	...
Mt. Magnet ...	Nil	...	Nil	...
Youeragabbie ...	Nil	...	...	...
Murrum	Nil	...	Nil	...
Challa	5	1	Nil	...
Nunngarra ...	Nil	...	...	...
EAST MURCHISON:				
Gum Creek ...	...	...	...	...
Dural	15	1	...	...
Wiluna	17	1	Nil	...
Mt. Sir Samuel ...	Nil	...	Nil	...
Leinster G.M. ...	2	1	Nil	...
Lawlers	Nil	...	Nil	...
Lake Darlôt ...	7	2	...	...
Darda	Nil	...	...	...
Salt Soak ...	Nil	...	...	...
Duketon ...	Nil	...	...	...
NORTH COOLGARDIE GOLDFIELDS:				
Burtville ...	...	...	...	...
Laverton ...	Nil	...	Nil	...
Mt. Morgans ...	Nil	...	Nil	...
Murrin Murrin...	10	1	Nil	...
Mt. Malcolm ...	Nil	...	...	...
Mt. Leonora ...	40	2	Nil	...
Tampa	Nil	...	Nil	...
Kookynie ...	Nil	...	Nil	...
Niagara	Nil	...	Nil	...
Yerilla	...	...	...	...
Yundamindera ...	14	2	Nil	...
Mt. Celia ...	...	...	...	...
Edjudina ...	...	...	...	...
Quandinnie ...	...	...	...	...
Menzies	Nil	...	Nil	...
Mulline	Nil	...	5	2
Mulwarrie ...	15	1	Nil	...
Goongarrie ...	16	1	Nil	...

Stations.	March. No. of points. 100 = 1in.	March. No. of wet days.	April. No. of points. 100 = 1in.	April. No. of wet days.
COOLGARDIE GOLDFIELDS:				
Waverley ...	8	1	...	...
Bardoc	15	1	Nil	...
Broad Arrow ...	4	1	Nil	...
Kanowna ...	4	1	Nil	...
Kurnalpi ...	3	1	Nil	...
Bulong	Nil	...	5	1
Kalgoorlie ...	25	1	Nil	...
Coolgardie ...	4	1	Nil	...
Burbanks ...	Nil	...	Nil	...
Bulla Bulling ...	Nil	...	Nil	...
Woolubar ...	Nil	...	Nil	...
Waterdale ...	Nil	...	Nil	...
Widgiemooltha...	Nil	...	...	...
50-Mile	...	...	...	...
Norseman ...	Nil	...	Nil	...
Lake View ...	Nil	...	Nil	...
Frazer Range ...	3	1	4	1
Southern Hills ...	Nil	...	Nil	...
YILGARN GOLDFIELDS:				
129-Mile	15	2	...	...
Emu Rocks ...	14	2	...	...
56-Mile	Nil	...	30	2
Glenelg Rocks ...	3	1	8	1
Burracoppin ...	Nil	...	8	1
Bodallin ...	Nil	...	...	...
Parker's Road ...	Nil	...	Nil	...
Southern Cross ...	Nil	...	5	1
Parker's Range...	2	2	...	...
Yellowdine ...	Nil	...	Nil	...
Karalee	Nil	...	Nil	...
Koorarawalyee...	Nil	...	Nil	...
Boorabbin ...	Nil	...	Nil	...
Boondi	Nil	...	3	1
SOUTH-WEST (NORTHERN DIVISION):				
Murchison House	Nil	...	...	...
Mt. View ...	Nil	...	1	1
Mumby	5	1	14	2
Northampton ...	Nil	...	Nil	...
Chapman Experimental Farm...	Nil	...	13	1
Narra Tarra ...	Nil	...	...	...

RAINFALL—*continued.*

Stations.	March.		April.	
	No. of points. 100 = 1in.	No. of wet days.	No. of points. 100 = 1in.	No. of wet days.
South-West (Northern Division)—*contd.*				
Oakabella ...	...	...	...	...
White Peak ...	...	...	...	...
Geraldton ...	Nil	...	24	1
Hinton Farm ...	Nil	...	11	1
Tibradden ...	10	1	23	2
Myaree	6	1	13	2
Sand Springs ...	Nil	...	16	1
Nangetty ...	9	1	2	1
Greenough ...	3	1	Nil	...
Bokara	3	1	11	2
Dongara ...	Nil	...	12	1
Strawberry ...	...	...	...	...
Yaragadee ...	...	...	...	...
Urella	7	1	11	1
Opawa	...	...	...	...
Mingenew ...	Nil	...	20	1
Yandenooka ...	...	...	...	...
Carnamah ...	6	1	14	1
Watheroo ...	5	1	29	2
Nergaminon ...	...	...	...	...
Dandaragan ...	10	1	51	3
Yatheroo ...	25	1	50	3
Moora	9	1	2	1
Walebing ...	7	1	29	3
Round Hill ...	3	1	...	...
New Norcia ...	12	1	28	4
Wongon Hills ...	*Nil*	...	...	...
Wannamel ...	25	1	35	2
Gingin	25	1	25	3
South-West (Metropolitan):				
Wanneroo ...	30	1	41	2
Belvoir	30	1	54	3
Wandu	21	4	51	5
Mundaring ...	19	1	...	...
Canning Waterworks	33	3	91	4
Kalbyamba ...	31	2	40	3
Guildford ...	26	1	42	3
Perth Gardens ...	63	3	44	4
Perth Observatory	37	4	54	3
Highgate Hill ...	30	2	57	3
Subiaco	27	1	54	3
Claremont ...	...	...	...	...
Fremantle ...	13	2	19	5

Stations.	March.		April.	
	No. of points. 100 = 1in.	No. of wet days.	No. of points. 100 = 1in.	No. of wet days.
South-West (Metropolitan)—*cont.*				
Rottnest... ...	15	3	21	3
Rockingham ...	47	3	38	2
Jandakot ...	48	2	83	3
Armadale ...	...	...	...	...
Mundijong ...	23	3	50	4
Jarrahdale ...	47	4	105	5
Jarrahdale (Norie)	36	4	86	4
Serpentine ...	28	4	53	5
Extreme South-West:				
Mandurah ...	21	3	43	3
Pinjarra (Blythewood)	39	4	53	5
Pinjarra	27	5	89	3
Upper Murray ...	36	4	157	7
Yarloop	29	3	88	5
Harvey	41	5	125	5
Brunswick ...	43	4	107	5
Collie	55	4	112	4
Glen Mervyn ...	31	2	132	4
Donnybrook ...	36	2	134	4
Boyanup ...	29	4	107	5
Bunbury ...	33	4	57	4
Busselton ...	33	6	53	6
Quindalup ...	61	7	...	...
Cape Naturaliste	94	5	73	6
Glen Lossie ...	67	4	...	...
Karridale ...	104	11	128	7
Cape Leeuwin ...	97	7	109	11
Lower Blackwood	63	2	114	5
Ferndale ...	...	...	...	...
Greenbushes ...	53	2	278	...
The Peninsula ...	56	5	...	...
Bridgetown ...	78	5	29	4
Hilton	37	1	...	...
Greenfields ...	32	2	88	4
Cundinup ...	18	2	50	2
Wilgarrup ...	71	4	103	8
Balbarrup ...	93	4	186	5
Bidellia ...	106	3	...	...
The Warren ...	...	...	...	...
Westbourne ...	68	5	73	5
Deeside	109	4	176	7
Riverside ...	78	3	142	7
Mordalup ...	115	3	...	...
Lake Muir ...	87	3	77	3

RAINFALL—*continued.*

Stations.	March. No. of points. 100 = 1in.	March. No. of wet days.	April. No. of points. 100 = 1in.	April. No. of wet days.
Eastern Agricultural Districts:				
Emungin ...	14	4	11	3
Dowerin ...	7	1	9	1
Warramuggin ...	...	...	...	...
Monglin	...	...	...	...
Hatherley ...	Nil	...	...	...
Momberkine ...	6	1	13	1
Eumalga ...	10	1	38	2
Newcastle ...	12	1	26	2
Craiglands ...	32	2	51	3
Eadine	3	1	...	...
Northam ...	7	2	14	2
Grass Valley ...	Nil	...	...	...
Cobham	13	2	24	3
York	1	1	19	2
Burrayocking ...	Nil	...	16	2
Meckering ...	6	1	21	2
Cunderdin ...	...	...	...	...
Doongin	Nil	..	15	1
Whitehaven ...	6	1	20	1
Mt. Caroline ...	Nil	...	8	1
Cutenning ...	7	2	...	...
Kellerberrin ...	1	1	9	1
Cardonia ...	Nil	...	...	...
Baandee ...	Nil	...	12	1
Nangeenan ...	Nil	...	5	1
Merredin ...	Nil	...	6	1
Codg-Codgen ...	...	...	...	...
Noongarin ...	...	...	...	...
Mangowine ...	Nil	...	...	...
Yarragin ...	1	1	...	...
Wattoning ...	Nil	...	...	...
Great Southern Railway Line:				
Dalebridge ...	10	1	13	2
Beverley ...	5	1	11	1
Brookton ...	...	...	...	...
Sunning Hill ...	6	2	30	3
Pingelly ...	8	1	30	1
Yornaning ...	11	1	26	3
Narrogin ...	15	3	36	4
Narrogin Experimental Farm	...	...	...	...
Wagin	75	1	21	3
Katanning ...	14	1	33	4
Sunnyside ...	26	2	30	5
Broomehill ...	26	2	39	5

Stations.	March. No. of points. 100 = 1in.	March. No. of wet days.	April. No. of points. 100 = 1in.	April. No of wet days.
Great Southern Railway Line—*contd.*				
Woodyarrup ...	...	...	44	4
Pallinup... ...	32	2	24	3
Tambellup ...	46	4	...	...
Toolbrunup ...	43	3	38	2
Cranbrook ...	...	...	...	...
Stirling View ...	40	4	73	4
Kendenup ...	67	4	58	8
Woogenellup ...	46	3	...	...
Wattle Hill ...	149	12	126	12
St. Werburgh's...	67	7	...	...
Mt. Barker ...	101	9	70	8
West of Great Southern Railway Line:				
Talbot House ...	7	1	25	2
Jelcobine ...	Nil	...	25	2
Bannister ...	18	3	...	...
Wandering ...	17	2	44	2
Glen Ern ...	13	3	41	3
Marradong ...	Nil	...	62	2
Wonnaminta ...	...	...	...	...
Williams ...	6	1	36	2
Rifle Downs ...	43	2	62	5
Darkan	...	...	...	...
Arthur River ...	4	1	25	...
Glenorchy ...	4	1	52	3
Kojonup ...	21	3	62	4
Blackwattle ...	90	2	80	2
Warriup ...	42	3	...	...
Forest Hill ...	96	5	135	8
East of Great Southern Railway Line:				
Sunset Hills ...	7	1	17	2
Oakdale	6	1	17	2
Barrington ...	3	1	6	2
Bally Bally ...	8	2	20	2
Stock Hill ...	Nil	...	11	1
Qualin	12	1	...	...
Woodgreen ...	3	1	16	3
Gillimanning ...	9	2	...	...

RAINFALL—*continued.*

Stations.	March. No. of Points. 100 = 1in.	March. No. of wet days.	April. No. of points. 100 = 1in.	April. No. of wet days.
East of Great Southern Railway Line—*cont.*				
Wickepin ...	17	2	...	...
Crooked Pool ...	19	2	29	3
Bunking ...	Nil	...	26	2
Bullock Hills ...	3	2	6	1
Dyliabing ...	7	1	27	4
Glencove ...	6	2	27	4
Cherillalup ...	...	...	...	...
Mianelup ...	31	3	...	...
Woolganup ...	16	3	...	...
Chillinup ...	...	...	...	...
Jarramongup ...	17	7	...	...
South Coast:				
Wilson's Inlet ...	96	4	208	11
Grasmere ...	146	6	180	9
King River ...	85	5	147	4
Albany	130	8	175	12
Point King ...	107	5	161	6
Breaksea ...	57	11	134	16
Cape Riche ...	93	5	18	2
South Coast—*cont.*				
Peppermint Grove	107	5	47	7
Bremer Bay ...	105	4	33	6
Coconarup ...	21	5	1	1
Ravensthorpe ...	49	4	9	2
Cowjanup ...	28	6	...	...
Hopetoun ...	112	2	7	2
Fanny's Cove ...	49	3	...	...
Park Farm ...	35	4	18	2
Grass Patch ...	19	1	Nil	...
Swan Lagoon ...	46	3	11	2
30-Mile	33	3	12	2
Gibson's Soak ...	72	3	10	2
Myrup	77	3	20	3
Esperance ...	13	4	18	3
Boyatup	...	...	...	...
Lynburn ...	...	...	...	...
Middle Island ...	...	...	...	...
Point Malcolm ...	26	3	...	...
Israelite Bay ...	44	4	7	2
Balbinia	20	1	...	...
Balladonia ...	Nil	...	1	1
Eyre	4	1	18	4
Mundrabella ...	...	...	...	...
Eucla	3	1	Nil	...

The Observatory, Perth,
9th May, 1906.

W. E. COOKE,
Government Astronomer.

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EDITOR'S NOTES.

WHITE WYANDOTTES FOR SALE.—The manager of the Government Experimental Farm at Hamel has a few white wyandotte cockerels for sale at 10s. 6d. each; also sittings of eggs at 12s. 6d. per doz.

WINE AS A GERM DESTROYER.—Dr. Dalton maintains that wines, more especially red wines, have a germicidal action upon pathogenic micro-organisms. He instances an elderly patient, who said, "It is strange that when I was young all my friends partook of wine for dinner, and one seldom heard about indigestion, stomach complaints, or appendicitis. Now my friends are all water-drinkers, and they all suffer from these complaints. It is my opinion that wine is a germ-killer."

GRASS-TREE GUM.—The common grass-tree gum and gum accroidies is in large supply from Australia just now, but the lots are sent by shippers in such careless condition that the sale is difficult at auction. Brokers will only offer or accept on consignments, gum from shippers whose produce has already been through their hands, or known to the market. Shippers of gum are advised to specially "pick" and strip lots. The best lots, graded accroidies, picked, will sell at 17s. 6d. per cwt.

GOLDFIELDS' GARDENS.—In the April issue of the *Journal* we reproduced a number of illustrations of gardens on the Eastern Goldfields. The blocks, which are the property of the *Kalgoorlie Miner*, were kindly lent by that paper, and it was the intention to insert a short description of each place illustrated; this, owing to pressure of other matter, we were unable to do at the time. We have received a further lot of blocks through the courtesy of the same paper, which we intend to make use of at an early date.

THE ARAB.—An illustration of the value of the Arab stallion in producing a most useful stamp of horse, is shown in the following extract from scraps in the *Live Stock Journal*:—"Among the horses belonging to His Majesty (King George III.) at the Great-lodge," says Mr. Frost, in 1807, "is a small Arabian stallion called the Hampton Court Arabian. This horse is about 13h. 3in. high, and, notwithstanding the smallness of his size, if put to a large, roomy mare, he gets horses 16 hands high, and full of bone, capable of carrying 20st. a fox-hunting."

GOATS AND SCRUB.—A correspondent, writing to an exchange recently, gave the following instance of the value of goats on freshly cleared land. He says:—"I felled 40 acres of scrub land and burnt off the timber about six months ago. The land was divided into two paddocks of about equal size. In the one I allowed my goats to roam, with the result that to-day there is scarcely a sucker of new growth or a weed to be seen. On the other block, however, which had been protected from the goats, the new timber growth is three or four feet high, and would cost at least fifteen shillings an acre to bring into the same condition of the piece the goats had the run of."

NATIONAL SHOW.—It is notified that the National Show, which is to be held at Narrogin this year, will be opened on 20th November and continued the following day, and not on the 13th as previously announced. The Secretary of the National Show, writing under date of the 11th inst., states: "In donating a sum of £5 5s. as a special prize to this year's National Show, the Swan Brewery Company state they intend to give a like sum for the best sample of malting barley, the exhibit to consist of not less than 10 bags, to be shown at the National Show, 1907." To those who intend to compete for this prize we would draw their attention to a paragraph on "Barley Threshing" that appeared on page 4 of the January issue of the *Journal*.

ERRATA.—In an article on Potato Culture, by Mr. Wallas, which appeared in last month's *Journal*, by some means two of the blocks used for illustrating the matter were transposed. That on page 424 should have appeared on page 426 as the "Potato Moth," and the block on page 426 should have been on page 424 as representing the potato scab. The author also wishes a correction to be made in the sentence commencing on line six, page 414, which reads, "if, by lack of thorough tillage and care, a comfortable home for the plant is not provided, nor are the full resources of the soil made available," so that it will read as follows:—"if, by lack of thorough tillage and care, it does not provide a comfortable home for the plant, and make its resources available." A bulletin, which has been revised, has been issued containing this article, and is now ready for distribution. Copies may be obtained on application to the Department.

A LARGE OX.—What is described in the newspapers of the day as "the most remarkable, large, and fat ox ever exhibited in England," was killed on 17th December, 1779, by Mr. Coats, a butcher, in Darlington. It was rising six years old, and was bred and fed by Mr. Christopher Hill. Its dimensions were:—Height, at the crops, 6ft.; at the shoulder, 5ft. 9¼in.; at

the loins, 5ft. 8in.; from the breast to the ground, 2ft. 1in. Length, from horns to rump, 9ft. 5½in. Breadth, over the shoulders, between two perpendiculars, 2ft. 10½in. Girth, before the shoulder, 9ft. 7½in.; behind the shoulder, 10ft. 6in.; at the loins, 9ft. 6¾in.; over the first rib, 10ft. 5in. Circumference, drawn with a cord from one ear along his side and round the hips to the other ear, 18ft. 7½in. Weight, the four quarters, 151st. 10lb.; the two forequarters, 75st. 7lb.; the two hindquarters, 76st. 3lb.—14lb. to the stone. At the same place and time three sheep were killed which weighed 47¼lb.

PHOSPHATE DEPOSITS.—The deposits of phosphate rock at Kapunda, South Australia, are steadily advancing in importance. Large quantities are being delivered in Kapunda for farm use, and still larger quantities are being sent away by rail for Adelaide and Melbourne. The *Adelaide Observer* says the supply of phosphatic rock is practically unlimited. It has been proposed to start works in Kapunda for the conversion of the rock into superphosphate by utilisation of the sulphide ores in the Kapunda copper mines; but so far nothing has been done. Several discoveries of phosphate rock have been made in every direction round Kapunda. There is no reason to doubt that supplies of phosphatic rock will be found in payable quantities in this State. Attention to this is being given by several persons of late, and it is to be hoped that their search will be rewarded. The most likely country, so far as is known at present, is situated on the Midland line, between Perth and Moora.

COLONIAL GRAPES IN GERMANY.—For some years efforts have been made by Cape fruit-growers to develop a trade in grapes with European markets, as the production of the Colony far exceeds the local demand for the sweet, heavy wines made from South African grapes. These efforts, however, were not attended by success so long as the grapes were sent to London *via* Southampton, where they formed only a fractional part of the total Colonial fruit imports. Further, it was impossible to ship larger consignments, as the British ships, although equipped with freezing chambers, possessed no cool chambers such as are essential for the preservation of grapes. A few days ago, however, the first consignment of Cape grapes arrived at a German port by the "Admiral." They were grown at Constantia, near Capetown, and were landed, after a 22-days' voyage, in a perfectly fresh condition. It is stated that next season great quantities of this fruit will be regularly imported to Hamburg and distributed to the inland markets all over the Continent.

EGGS IN COLD STORAGE.—An experiment has just been made by an officer of the Department of Agriculture to test the hatching properties of eggs that had been kept in cold storage. Eggs were obtained in November of last year, and placed in cold storage by Mr. Cairns at the Government Refrigerating Works on the 1st of December. They were subjected to a very severe test. At times the temperature was shown as low as 38° F. In April, a clutch was taken out and placed under a hen. On the fourth day the eggs were tested, when seven were found to contain live germs, three had just started germination, and died, and the remaining three eggs were nfertile. On the seventh day two more were found to contain dead germs;

the five remaining ones continued to die off, only one chick being fully developed, but had not stamina enough to emerge from the shell. Although the experiment can hardly be claimed a success, yet the main point, *i.e.*, that the germ is not destroyed by cold storage, opens up a big field for experiments for the safe transit of valuable eggs over long distances.

CURD TEST FOR CHEESE-MAKING.—The Wisconsin curd test is perhaps the simplest test for cheese-makers to adopt where there is any doubt as to the purity of the milk employed. The test can be carried out without any outlay in plant if the cheese-maker possesses sufficient glass or glazed earthenware jars in which to test the samples required, a tank or bath in which water can be kept at an even temperature, a thermometer, a bone or silver knife, and a little cheese rennet. The jars must be thoroughly clean and sterilised with live steam, or immersed in boiling water, dried, and numbered. The samples of the milk to be tested are put into the jars provided, and each lot heated to 98 degs. F., and a little cheese rennet added. The rennet is mixed in the milk by giving the jar a rotary motion, and the curd allowed to stand for 20 or 30 minutes until firm, when it is cut and the whey drained off. The jars containing the curd are then covered over and returned to the bath or vat, which is kept at a temperature of 98 degs. F. for 6 or 12 hours. By cutting the curd in small pieces with a clean knife and smelling it, it is possible to discover if any of the particular samples tested have developed gases or bad flavours, also if any of the curd is spongy or of indifferent texture. Uncertain samples of milk should always be rejected for cheese-making.

HOGS FOR SMALL FARMERS.—There is one advantage about pigs that make them emphatically the stock for the poor man or the small farmer, and that is the very quick returns which they afford by the rapidity with which they increase and come to maturity. A good brood sow, given good treatment, so as to be kept in a good thrifty condition, will farrow two good litters of pigs a year that will run from seven to eight pigs in each litter; and if proper feed and care is given these may be ready for market by the time they are eight or nine months old at the farthest. No other stock kept on the farm will make so good a return in so short a time. Sheep will come nearest to it, but in the same length of time a pig will make double the weight of a lamb. Another advantage with pigs, is that they are marketable from the time they are farrowed until they are fattened for market. A sow with a litter of pigs, and growing pigs three, four, or five months old, will sell at full market prices; so that the farmer is not obliged to feed them to maturity to get a little money out of them. With a little management pigs may be fattened to sell in the spring and autumn, when it is possible to secure the best gain at the lowest cost; and when it is considered that they utilise much on the farm that would otherwise go to waste, it is only in exceptional cases that at least a few cannot be kept on the farm with profit.—*Midland Farmer*.

THE KICKING COW.—The kicking cow is possibly the greatest nuisance on the farm, because she, in a great measure, is like the kicking horse—never completely broken of the habit. When a cow gets in the habit of raising her foot and banging away at something or somebody every time her

teats are touched, it seems so helpful and natural with her that she soon feels like kicking at everything that passes her way or comes near her. The cow raised out in the open herd and never handled or educated to understand human kind, only to be frightened by some one throwing at her or jumping at her, to see her frightened gyrations in trying to get away to a safe distance, cannot be expected to be gentle and quiet when first penned to be milked. It takes a grandmaster in the cow-milking business to successfully handle such a cow. A large percentage of such cows are turned loose to run in the herd and suckle their calves, after a few weeks or a few days' effort to milk them. An excitable, high-tempered, ill-natured person cannot break a wild cow to milk quietly. This is one of the impossible things; they may beat the cow, and fasten her so she cannot kick, but the cow's spirit of self-defence is still there, and will break out when opportunity is given. It is not an uncommon thing to hear persons remark that a pet heifer is always hard to break to milk, because she is not afraid of anything. This is a wrong idea, or a wrong application of the heifer-breaking idea. The quiet, gentle heifer, if properly handled, is a quiet, gentle cow from the start.

PLANTING WHOLE TUBERS.—Evidence is accumulating (writes Primrose McConnell, B.Sc.) that for seed purposes it is a mistake to cut potatoes into small size. It has never been the custom in some districts to thus divide potatoes, but in others it has been the practice for generations. The idea, in the past, has been to prefer good-sized tubers, and to divide them into two or three pieces, each with at least two eyes, on the principle that the large seed would be the most vigorous and yield the best crop, and also because it saved the weight of seed per acre. On the other hand, the dividing of a potato severs the fibres, which ramify in its substances, from each eye, and thus weakens the initial growth—perhaps more than the original size of the potatoes strengthens the same. Again the cut surfaces start bleeding, and there is a waste of sap, and an entry made for fungoid enemies, even where lime is dusted over them. It is being found that moderately sized and planted whole give the most satisfactory results over even fairly large seed, and where it takes a ton or over to plant an acre. A friend of the writer, who "boxes" a lot of his seed, finds that even small tubers, if boxed a long time and thoroughly "greened" in the intervening months, give the best results and greater freedom from disease. It is rather curious that the small immature tubers do not disease so readily as the bigger ones, and out of a rotten heap one may pick many small potatoes quite untouched. Cutting is done, of course, with the sole object of saving seed, and in the olden times, before the days of the potato disease, the eyes were actually gouged out and the "buds" only planted; but all experiments in these late years go to show that a whole, fair-sized set gives the best all-round results.

TEST FOR THE PURITY OF MILK.—An excellent test for the purity of milk, which is within the reach of all, may be arrived at by boiling milk in an enamelled, or milk, saucepan. If the milk will boil without curdling, it may be considered fit for consumption by even the most delicate person. If, on the other hand, it curdles before reaching boiling temperature, it is unfit for direct consumption. The causes of curdling may be want of cleanliness; the presence of too much acid in the milk caused by keeping the milk too long, and at too high temperature, or in a moist atmosphere; or

the mischief may ocur by foreign species of bacteria gaining access to the milk, or by the milk coming in contact with decomposing matter or badly trapped drains. Milk from diseased udders will seldom boil; neither will milk from a newly-calved cow boil, by reason of the excessive amount of albumen present. At the end of four days, colostrum, as the milk of a newly-calved cow is known, may be mixed with other milk and used for the manufacture of fresh butter, but it is not advisable to employ it for cheese-making, or for keeping butter, until nine days have elapsed since calving. In a series of tests carried out on several Lancashire farms last year, it was shown that the milk of newly-calved cows contain less than a third the amount of fat present in normal cow's milk, when the milk was tested at the end of twelve hours after calving. Later tests showed that the milk rapidly increased in fat during the first three days, and that at the end of the third day the milk was usually one or two per cent. above normal. Continued tests showed that the percentage of fat in the milk fluctuated considerably after the third day until the milk assumed its normal condition.

LARGE SEED *v.* SMALL SEED.—The Minister of Agriculture in the United Kingdom is about to decide whether a seed control station shall be established or not. If we employ small cattle, we expect to breed small cattle; if we employ a small breed of sheep or a small breed of pigs, we never for one moment expect to produce progeny of large size. It may be at once admitted that in the case of live stock fed entirely upon the produce of a farm, something depends upon the character of the soil—the presence or absence of lime, for example, which is essential in the production of bone. But this condition may be recognised quite apart from that which is at issue. We contend, therefore, that as in the case of live stock, so in the case of the plants of the farm. If we would obtain large produce, whether in corn, peas, cocoa-nuts, or oranges, we must plant large seed, or how can your trees bear large fruit—large seed which is the produce of stout and vigorous plants? If we admit that large seed should produce larger grain than small seed, we at once admit the whole facts of the case, for large grain, assuming it to be sound and properly filled, is heavier than small grain, seed for seed. Thus it is that we get more bushels to the acre and a greater weight. The thing is so evidently palpable that there ought not to be the least hesitation in accepting, not a doctrine which an experimenter attempts to propound, but a statement of facts. There is this further fact about large seed, that—especially if it is selected from growing plants, the best which can be found in the field, these plants being marked, the seed being consequently saved with care, and then dressed—we can not only depend upon the crops resulting from it being larger and heavier in quantity, but upon a general improvement of the crop, an improvement which usually follows where selection has taken place. If, then, plants are annually selected, and the seed they grow saved, a system is being followed which tends to improve from year to year, instead of to decrease, as is the case where inferior seed is sown and the best sold.

DOES POULTRY PAY.—The eternal question—"Does poultry farming pay?" has been revived by the State egg-laying competition. A poultry expert declared to his audience that a healthy hen in this State would produce a revenue of £1 14s. per year. On the other hand, many small poultry-keepers declare that their eggs never cost them less than 100 per cent. over the market price. Now, here are some exact figures, which may

be taken as a reliable guide, and exact figures and not flowers of speech are what the poultry-man wants. The annual egg-laying competition at the Hawkesbury (N.S.W.) Agricultural College, just concluded, gave a surplus of receipts for the sale of eggs over expenditure to the amount of £240 for the 12 months, 600 hens being engaged. At the Rockdale competition in the same State, 300 hens gave a profit of £130. Thus, in the two competitions, 900 hens earned a total profit of £370. As one man can manage a flock of 1,000 head, though it means steady and constant work, this shows that there is the possibility of his making £7 per week at the game. Now, don't run away and buy a thousand hens on the strength of these figures. The 900 engaged in the competition were picked layers. On the other hand, feed was dear and eggs cheap in the mother State. The average price of bran was 9d. per bushel, pollard 1s. 1d., wheat 3s. 5d., and maize 3s. 10d., while eggs sold as low as 6½d. per dozen, ranging from that up to 2s. It is further interesting to note that the highest average profit was earned by Imperials, which laid 200 each, bringing in 16s. 10d. for the year; and the lowest by Old English Game, which produced only 129 eggs each, worth 8s. 4d. The cost of feeding each fowl was 5s. 3½d., so that the lowest on the list earned a profit. While the average poultry-man is not likely to attain the full measure of success as in these competitions, the figures indicate that poultry-farming as a business, not perhaps as a side show, does pay.

PRACTICAL DEMONSTRATION IN WHEAT-GROWING:—In the report of the course for teachers at the Hawkesbury (New South Wales) Agricultural College, the Sydney *Daily Telegraph* has this interesting statement:—"As a vivid instance of the immediate practical influence which the country school teacher might exert on his district through his scholars, Mr. Potts gave particulars of the work of a teacher on the fringe of the mallee country in Victoria. The industry was wheat-growing, but the yields were small, and the farmers were poor. When travelling through the district as a member of the Victorian Commission on Technical Education he (Mr. Potts) suggested to the teacher that it might be a good thing to supplement the ordinary school curriculum with practical demonstrations from a nature-study point of view, calculated to arouse a spirit of observation and to instil a love for the avocation of the parent. 'But there's nothing else about here but wheat,' said the teacher dolefully; 'I'm sick of wheat.' 'Then wheat is the thing for you to concern yourself with,' was the rejoinder. So the children were taught the development of the grain into root and plant by blackboard demonstrations, and subsequently they were induced to bring from home a quart of seed, being part of that used by their fathers for sowing. From these, 100 grains were selected, including the weeds and rubbish, and the germinating power shown by means of two plates and a piece of damp blotting paper, and by that means they were able to detect the useful grain from the weeds and the inferior grain. Later on a plot was selected for each boy in the schoolyard. Each boy was given a notebook, and the land was cultivated, and preparations made for a number of experiments. The first row was sown and cultivated exactly as Dad had been in the habit of doing it at home—unselected seed and the minimum of cultivation. The second row was sown still shallow, but with selected grains. The third row was cultivated deeper, and more thoroughly, and sown with selected seed. The next three rows were similar, except that different manures were added. Then there was a row sown with selected seed from new introduced varieties. Finally, Dad's row was repeated just to round off the plot. The rainfall

was carefully recorded week after week, and whenever rain fell all the rows were surface stirred—except Dad's. Ultimately, each row was carefully harvested, and the results compared. Dad's came out of the comparison badly. What was the result? Those boys, instead of wanting to go to Melbourne, to get on to the tramways or into the police, became so interested in wheat-growing that their ambition was to become growers, and they had no small influence on the farmer's methods. It lay within the power of the country teachers to rouse the same intelligent interest in the rural avocations of their respective districts, and the work faithfully performed would prove in time to be of inestimable national advantage."

Sheep and Environment.—The adaptation of sheep to their environment should be the first study of the pastoralist, so says "Bruni," in the *Australasian*. There are always certain breeds of sheep that will thrive in a locality, and though other breeds may in time become thoroughly acclimatised, they must alter considerably from the original type before they become so, and in all probability they will never become as profitable to the breeder as those breeds that are naturally adapted to the conditions of life in the locality. The effect of the environment is shown in the breeds of sheep raised in New Zealand and those raised in Australia. In our island-continent the merino is still king, notwithstanding the increase of the down breeds during the last score of years. In New Zealand, though the bulk of the original sheep were merinoes, the English breeds now largely predominate. In a résumé of the stud sheep industry of New Zealand, which appeared in the *Farmers' Union Advocate*, the numbers of the principal breeds of stud sheep are given, which show some results that will cause surprise to pastoralists outside the colony. In the principal sheep-breeding areas the long-wools predominate largely, and of these the Romney Marsh sheep stand prominently at the head of the list in point of numbers. The English Leicesters are slightly in advance of the Lincolns, while the bulk of the Border Leicesters are confined to two provinces. The Shropshires are a long way behind, while the Southdowns and Cotswolds are in comparatively small numbers. The colony of New Zealand extends over a great distance north and south, but owing to the form of the islands, the rainfall is much larger and more frequent than it is over a very large portion of Australia. The climatic conditions of the colony have led to the establishment of a different system of sheep-husbandry to that which obtains in the Commonwealth. In New Zealand the growing of fodder crops for sheep is a common farm industry; in Australia it is the exception, though the practice has extended of late years. The Romney Marsh stud sheep are very numerous in Hawke's Bay and Wellington; they are fairly numerous in Otago, but are not in favour in Canterbury. In the province of Canterbury, which is famous for the production of high-class mutton, the predominating breed is the English Leicester; the merino, Shropshire, and Border Leicester coming next in that order, after a good gap. New Zealand carries a much larger number of sheep in proportion to its area than does the State of Victoria, but that is mainly due to the greater rainfall, partly to the system of husbandry adopted, and to the prejudice that formerly existed in Victoria against the keeping of sheep on farms. That prejudice is rapidly disappearing, and with the improved system of sheep-husbandry that is now being initiated, I feel convinced that twenty years hence the number of sheep in Victoria will equal, if not surpass, that in New Zealand.

A Hardy Rubber Tree.—Whilst the rubber fever is at its height, and there is a rush of men and capital to all parts of the tropics wherever rubber, and especially Para rubber, is likely to thrive, we may venture (says the *Field*) to call the attention of planters in this country to a tree which may prove of commercial importance as a source of rubber, or, rather, of gutta-percha, a tree, too, which is as hardy and as well-behaved under cultivation within 10 miles of St. Paul's as the common hazel. This tree, known as *Eucommia ulmoides*, was first discovered in the middle Yangtse-Kiang River, in China, about 20 years ago, by Dr. A. Henry, who sent specimens of it to Kew, stating that it was a tree 20 feet to 30 feet high, and that its bark was a most valued medicine with the Chinese, who cultivated it under the name of "Tu-chung." These, on examination by Professor Oliver, were found to contain caoutchouc, every part of the plant—stem, branches, twigs, leaves, and roots—showing traces of it. The tree is supposed to belong to the same family as the witch hazels *(Hamamelidaceæ)*, no other members of which are rubber or gutta yielding plants. The French chemist, M. Leaute, to whom samples of the caoutchouc from *Eucommia* were submitted, said that it was of good quality. These samples were no doubt from Chinese trees. On the other hand, a sample of bark from trees grown in Europe did not give so satisfactory a result. It showed traces of caoutchouc, but of poor quality. Possibly the trees from which the bark was obtained were not in good condition, or the bark was collected at the wrong time, or the trees were too young. At any rate, there is no reason why this tree, grown in Great Britain, should not yield rubber or gutta in the same quantity and of the same quality as it does in China. Ten-year-old trees in England are as healthy as apples or hazels. We are told that in France large plantations have been made of *Eucommia*. Plants may be raised from seeds imported from China, or from cuttings of the ripe one-season shoots nine inches or so long, planted in autumn in a border and covered with a handlight, exactly as in the case of cuttings of roses, etc. A still quicker method is that of summer cuttings, *i.e.* young shoots about half ripe, which root readily if placed in sandy soil in heat and kept close in a frame. Large batches of plants may soon be worked up in this way. When the plants thus raised are two or three years old, they require to be pruned to one stem, and this should be encouraged to grow up by removing the laterals that grow too strong; otherwise a clear stem will not be formed. The largest plant of *Eucommia* we have seen is at Kew, where it has stood out of doors since 1897, so that it will now be some ten years old. It has three stems, each about seven inches in circumference, freely branched, and eight feet high. This tree has the appearance, in winter, of a healthy young elm. It has never received any protection from frost, and it is in an exposed border far removed from a wall. The soil in the border is ordinary loam. In dry weather the border is watered on account of the herbaceous plants it contains. We believe that Messrs. Vilmorin-Andrieux & Co., Paris, advertise young plants of the *Eucommia* for sale. While rubber might be grown in the northern portions of this State, there is no reason to doubt but what the plant under notice should not thrive as far south as Geraldton.

EXAMINATION OF THE WESTERN AUSTRALIAN POISON PLANTS.

By E. A. Mann, Government Analyst and Chemist to the Department of Agriculture of Western Australia.

The Director of Agriculture, Perth.

In my first progress report of the above work I described fully the results of the examination of the York Road Poison Plant (*Gastrolobium calycinum*), the most important of which was the discovery that the poisonous principle consisted of a new alkaloid, Cygnine. Other interesting bodies were also obtained. (*Journal of the Department of Agriculture*, December, 1905.)

The second progress report announced the discovery of an alkaloid in a new plant from the North-Western portion of this State, named by the Government Botanist, Dr. Morrison, *Indigofera oviperda*. This report was incomplete, as I had to await the necessary supplies of the plant. (*Ibid.*, January, 1906.)

I now have pleasure in presenting my third progress report describing the work which has just been completed, on the Box Poison, which was selected as a representative of the genus *Oxylobium*, as the York Road was of the *Gastrolobiums*.

I regret to state that Dr. Ince, who has so far been associated with me in this investigation, has been obliged to relinquish the work, on account of ill-health. The ability and interest he has manifested in this research have been largely the cause of its successful progress, and I greatly regret that he will not be able to continue it. Other plants have already been put in hand, and their investigation has reached an advanced stage, but every endeavour will be made to prevent a break of continuity in the work.

THIRD PROGRESS REPORT.

Part I.—CHEMICAL EXAMINATION.

Having examined the "York Road" poison plant (*Gastrolobium calycinum*) as representative of the *Gastrolobiums*, the largest group of the native poison bushes, I decided to turn attention next to a representative of the *Oxylobiums*. For this purpose the plant known as the "Box" poison (*Oxylobium parviflorum*) was selected. This plant is almost, if not quite, as wide-spread as the York Road plant, and is looked upon with equal dread by pastoralists and stock owners.

The accompanying photograph (Photo. 1) indicates the appearance of this plant, and the following description of its botanical characters and habits is taken from a paper by Dr. A. Morrison, Government Botanist* :—

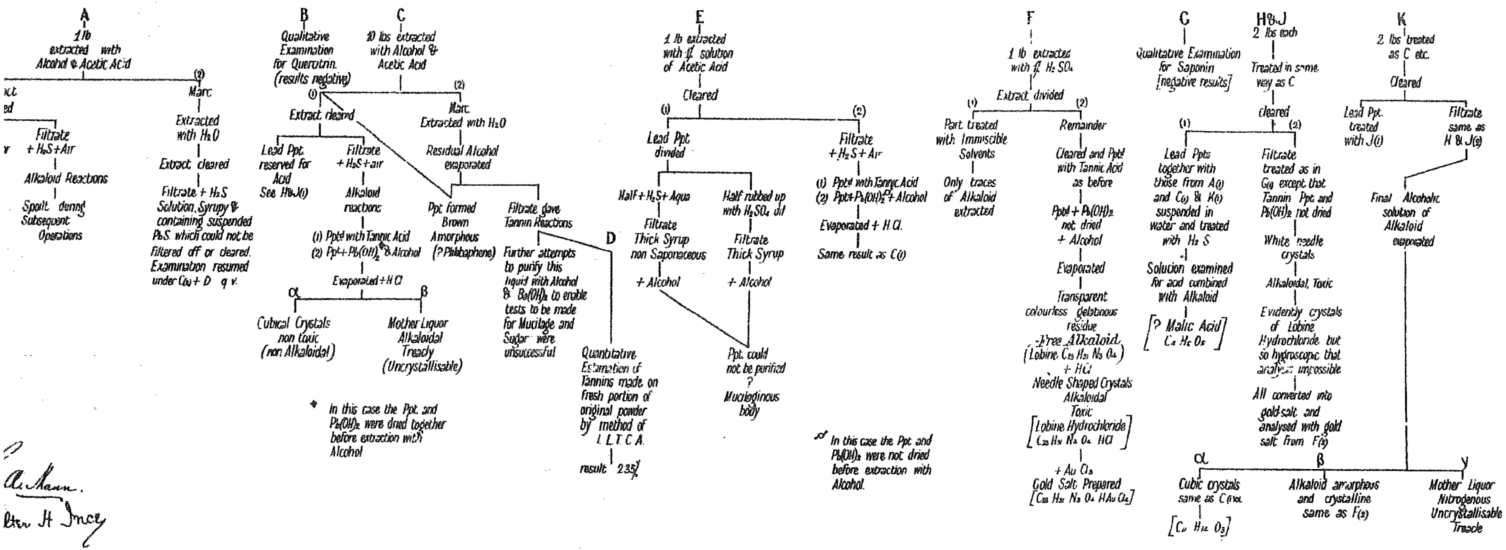
"*Oxylobium parviflorum*.—A tall spreading shrub, the young shoots hoary, with a minute silky pubescence; leaves alternate, opposite or in

* The *W. A. Settler's Guide*, Chap. VIII. The Poison Plants of Western Australia.

KEY PLAN OF EXAMINATION OF

OXYLOBIUM PARVIFLORUM

BER 1905 MAY 1906



threes, narrow, oblong, slightly wedge-shaped or linear, blunt, or notched, mostly about one inch long, leathery, hairless above, minutely silky pubescent underneath, the margins usually recurved; flowers small, orange yellow and purple, in slender bunches, terminal or in the angles of the upper leaves, often two to three inches long; calyx about two lines long, minutely pubescent, the points acute, and scarcely so long as the lower part, the two upper ones broader curved and united nearly to the top into a square upper lip; uppermost petal nearly four lines diameter, the lower ones rather shorter; pod on a rather long stalk, four to six lines long, hairy, with a narrow point; seeds only one or two instead of four, without any outgrowth near their attachment, embedded in a pithy substance lining the cell.

"The Box poison is found in the Central, Eastern, South-Western, and Southern districts of the colony, and grows in all qualities of soil—sand, gravel, clay, rocky or good land. Some believe it to be specially associated with the White Gum, so that when that tree is met with, the Box poison may be looked for. It flowers between August and December, and attains a height of six or eight feet, the minimum reported being one foot. It is a virulent poison, and produces a large quantity of seed, according to Mr. E. R. Parker, who states that he has known the flesh of pigeons that have been feeding on Box poison seeds, kill dogs and cats."

The material was prepared in the same way as described in my first report, and the examination was conducted along exactly similar lines.

In some respects, however, the plant differs entirely from the York Road plant in its composition and products—whether the difference between these two plants are characteristic throughout their respective genera, can only, of course, be shown by subsequent research. This is extremely probable, and is an illustration of the way in which chemical analysis can be made to assist botanical classification.

The botanical differences between these two genera are very slight, so much so, that the Government Botanist has informed me that it is only by certain small differences exhibited at special stages of their growth that some species can be distinguished. But, at any rate, as far as these two representative plants are concerned, chemical analysis discloses very marked differences. If similar characteristics are disclosed as other members of these groups are examined, we will have in analysis a ready means of identification. It is interesting to note that similar principles have been applied in a noteworthy degree to the distinction of various species of Eucalyptus and also of Citrus.

Instances of the differences encountered are given below.

At an early stage of the examination indications were obtained that the poisonous principle of this plant also is an alkaloid, and eventually we succeeded in isolating it in the pure state.

The separation of the alkaloid was, however, attended by similar difficulties to those we encountered with cygnine, to which it seems in some ways allied.

It is more stable than cygnine, but is nevertheless easily decomposed, and by its decomposition gives rise to cubical crystals of a non-toxic character, corresponding to those formed from that alkaloid. While the crystals from cygnine take the form of pyramids, these are flat crystals (*see* Photo. 2). These extraordinary crystals may lead to the discovery of

some very interesting facts as to the chemical relations between the two alkaloids, but these need not be discussed here.

The alkaloid itself has the chemical composition $C_{23}H_{31}N_3O_4$, and as it is new to science we have named it Lobine. It is more stable than cygnine, in that while we could only obtain the salts of the latter we were in this case able to separate the alkaloid itself without much difficulty. In some cases it was obtained as a semi-transparent horny mass, resembling isinglass in appearance, but under some circumstances it assumes a crystalline form, and then appears as long needles. (Photo 3.)

We also prepared the hydrochloride $C_{23}H_{31}N_3O_4$ HCl and the aurochloride $C_{23}H_{31}N_3O_4$ H Au Cl_4. The former crystallised in white needles, but so readily attracted moisture from the air (hygroscopic) that it was only with great difficulty we were able to obtain a photograph (Photo. 4). The aurochloride we were unable by any of the means applied to obtain in a crystalline form. In these respects both compounds differ from the corresponding bodies obtained from cygnine.

It will thus be seen that in both composition and chemical character the two alkaloids are quite different in some respects. In others they are very similar. The differences and resemblances might be tabulated as follows:—

Differences.

Cygnine.		*Lobine.*
(1.) Composition $C_{19}H_{22}O_3N_2$	...	Composition $C_{23}H_{31}O_4N_3$.
(2.) Cubic Crystals $C_{12}H_{16}O_3$	...	Cubic Crystals $C_9H_{14}O_3$.
(3.) Free Alkaloid too unstable to isolate	...	Free alkaloid comparatively stable.
(4.) The Hydrochloride not hygroscopic	...	Hydrochloride very hygroscopic.
(5.) Aurochloide, crystalline and unstable	...	Aurochloride, non-crystalline, stable.

Resemblances.

(1.) Formation of non-nitrogenous cubic crystals in course of decomposition.

(2.) Instability compared with many alkaloids.

(3.) Physiological effects.

In addition to the alkaloid, several other interesting bodies were discovered in the York Road plant; but, not only did these bodies not declare their presence in the Box in the marked manner they had done in the other plant, but they could not be found, even by a careful search.

Thus the following bodies, new to science, were found in the York Road, and named:—

(1.) Cygnic acid, in combination with the alkaloid.

(2.) Gastrolobic acid.

(3.) A mucilaginous body—Gastrolobin.

(4.) A sugar—Cygnose.

None of these were found in the Box, with the exception, perhaps, of No. 3. A mucilaginous body was present, but only in small proportions, and we could not separate it sufficiently pure to analyse, as in the case of gastrolobin. No other new bodies of strikingly peculiar characters were observed.

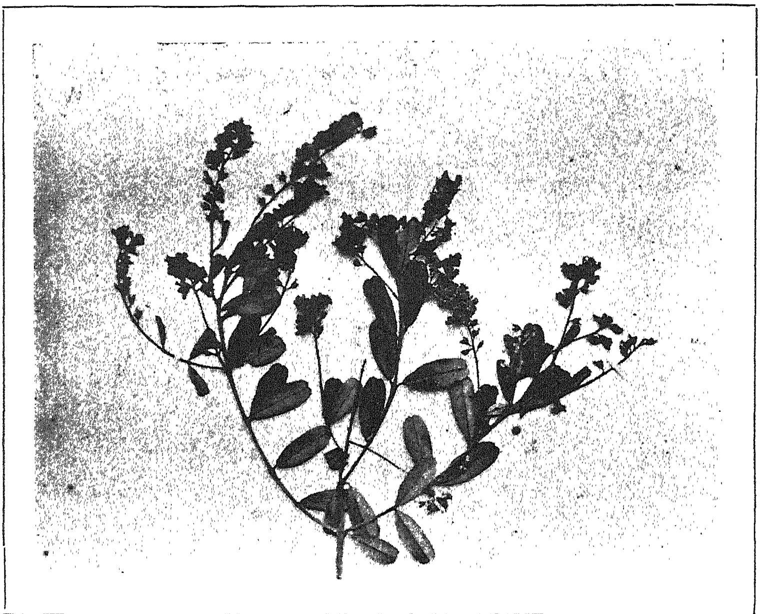


Photo 1. Box Plant (*Oxylobium Parviflorum*).

Lobine, instead of being, like cygnine, combined with a specific new acid apparently occurs in the Box as a salt of malic acid ($C_4H_6O_5$) already well known as occurring in plants. This was separated and analysed to prove its composition.

Perhaps one of the most striking differences, however, between the two plants was to be found in connection with the tannins. The York Road contained no tannin at all, but in the examination of Box the presence of a tannin was early manifested. This was estimated by the Hide powder method,* usually employed for determining tannin, and was found to be present to the extent of 2·35 per cent.

At certain stages of the investigation, also, an interesting body was encountered derived from this tannin and apparently belonging to a well known class of tannin derivatives called phlobaphenes.

If this difference be found to persist throughout all the members of the two genera, it will probably be the readiest means of distinguishing between a gastrolobium and an oxylobium.

The details of the chemical examination which, like those described in my first report, occupied a period of six months, are given in the attached key plan.

PART II.—PHYSIOLOGICAL.

The poisonous nature of Lobine, as well as the non-toxic character of the cubic crystals above described, had, of course, to be established by life tests. In these I had the assistance of Mr. T. I. Wallas, Acting Physiologist to the Department of Agriculture.

Two tests were made with the alkaloid, or rather its hydrochloride, of which the following particulars may be given:—

Test 1: 10th January, 1906.—One-tenth of a grain dissolved in a few minims of water injected subcutaneously into a guinea pig weighing 310 grams caused death in five minutes.

Test 2: 16th February, 1906.—One-tenth of a grain similarly injected into a guinea pig weighing 242 grams caused death in three minutes.

These doses are equivalent to 0·0264 gramme and 0·0209 gramme per kilogramme of body weight respectively.

The symptoms exhibited in each case appeared to be identical with those produced by cygnine.

As pointed out in my first progress report, it is desirable, from a scientific point of view, that the symptoms and exact fatal dose of these poisons should be made the subject of a special series of experiments; but these fall within the scope of the specially trained physiologist, and are outside of my particular sphere of work. Moreover, it does not appear that they would serve any immediately practical end. I hope, however, that the work on cygnine now being done at Cambridge by Dr. Dixon will supply the desired information.

The practical question which I have set myself to solve, viz., how the effects of these poisons on stock may be minimised? has however been engaging considerable attention.

* International Leather Trades Chemists' Association, 1902-3.

The two methods of treatment described in my first progress report have been put to practical trial, and (at least as regards the permanganate treatment), so far, with satisfactory results. Two special reports on the results were made to you and published in the *Agricultural Journal* of January and April last.

Packets of the necessary chemicals have been made up in my laboratory and issued, with instructions, to anybody applying for them. Altogether up to this date 33 sets of antidotes have been supplied to 23 persons in various parts of the State.

So far, very few reports have been received from these persons as to the efficacy of these antidotes; but this is only to be expected, as occasion has to be awaited for their application.

As soon as sufficient reports are received to provide satisfactory proof of their efficacy, steps may be taken to bring them into wider notice and circulate information on the subject generally.

In order to ascertain whether the permanganate treatment was likely to be equally applicable to lobine, a laboratory experiment was made similar to that with cygnine.

A quarter of a pound of the powdered Box was treated with one per cent. solution of hydrochloric acid, in order to extract the alkaloid (in imitation of the action of the gastric juice of animals), and then to the mixture of extract and solid material was added five grains of permanganate of potash. This was instantly decolourised; an additional two and a half grains were slowly decolourised, while a further addition, making 10 grains in all, was decolourised within three minutes. The extract after this treatment gave no reaction for alkaloids.

This result seems to indicate that lobine is just as easily destroyed by permanganate as cygnine, and that therefore this method of treatment is equally applicable in cases of poisoning by either of the plants so far examined.

WINE DISEASES.

By A. Despeissis.

(*Continued from pages 238 and 391.*)

The ORGANS OF SMELL AND TASTE combined detect *Aroma, Bouquet, Fragrance*, but these characters are not indicative of diseases, being inherent to the kind of grape itself and to the care exercised during fermentation.

Flavour.—Unlike the aroma, the bouquet, or the fragrance, the flavours are detected without the assistance of the sense of smell. They are either pleasant or unpleasant, according to the nature of the different tastes and their degree of intensity.

The primary number of flavours has been reduced by some physiologists to four, viz., *sweet, bitter, acid, salt,* to which a fifth one is added by others,

Photo 2. Cubic Crystals.

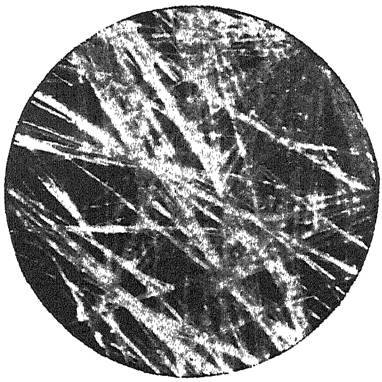
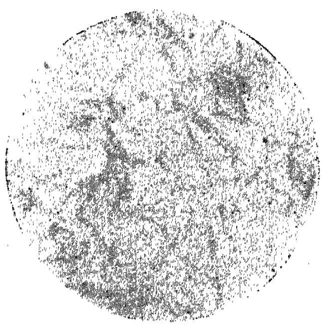


Photo 3. Lobine.



viz., the *metallic* flavour. Some other flavours as well cannot be overlooked, such as the *harsh, viscous, watery, dry* flavours.

A *Neutral Flavour* is one possessed of neither aroma nor any special taste, and such wines, which are generally produced by heavy-bearing vines, are mostly suitable for blending purposes.

Insipid, flat—a wine without vinosity and liveliness, which, without being actually diseased, shows none of the characteristics which make it pleasant. A wine too energetic fined, or left long in open bottles or a decanter, often turns flat. When in that state it is more subject to contracting diseases.

The *after-taste* may be either pleasant or unpleasant. For a short while after swallowing the wine, an earthy, yeasty, bitter or unpleasant flavour which remains may afford an indication of disease.

Silenced wine, partially fermented and possessing a sweet and mucilaginous taste, which has been stilled by means of concentration of the juice by pasteurisation or by means of alcohol, or of sulphur fumes or other chemicals not prohibited by law and acceptable on hygienic grounds. Too much sulphur sometimes generates hydrogen sulphide, which reminds one of rotten eggs, and leads to the formation of sulphates which impart to the wine bad flavours.

Sweetish wines in which the fermentation has suddenly got "stuck" before it is completed. That sweetishness is not well defined and is not in harmony with the other components of the wine. Unless checked at once by pasteurisation or by fortification, there sets in a gradual formation of manna sugar, resulting from the decomposition of the mucilaginous or albuminoid matters in the wine by alcohol, owing to the agency of a bacillus. The trouble is sometimes known under the name of "mannitic" disease.

Acerb caused by a distinct and unpleasant acidity mingled with astringency as in green fruit. Wines made with grapes which have not reached the period of maturity are more or less acerb and lack fragrance and fruitiness. The defect may within a measure be corrected by means of small but adequate additions of a concentrated solution of neutral tartrate of potash. After a few months a green or acerb wine mellows down on account of the gradual transformation of the malic acid.

Decrepit wine, an aged wine that is losing its more subtle constituents, which by degrees get worn or wasted. This occurs on long keeping, or the change may be more rapid under the influence of excessive changes of the temperature.

Dry wine leaves in the mouth a feeling of dryness. This is noticeable in astringent wines when all the sugar has been transformed into spirit. In high-class wines this dryness of taste is tempered by a soft and velvety feeling, due partly to the small amount of glycerine produced during fermentations.

Astringent when œnotannin predominates, leaves in the mouth a bitterish and iron taste. When this character is very pronounced the wine is *rough* or *harsh.* Time mellows those wines as the tannin becomes oxidised and is transformed into carbonic and into gallic acids. Fining will reduce the amount of tannin in the wine. This œnotannin is possessed of tonic as well also as preserving properties, as it coagulates and brings about the precipitation of the albuminoid matters whose presence in the wine is a source of danger.

Some wines, especially white wines fermented apart from the skins and the pips, are sometimes difficult to clear by means of isinglass, gelatine, white of eggs, and other such like substances. This is often due to lack of œno-tannin, and here blending with another wine, or a moderate addition of tannin commends itself. That tannin or tannic acid is extracted from gall nuts preferably by means of alcohol, as the ether extract both smells and tastes of ether.

Pure tannic acid dissolves completely in a 10 per cent. alcoholic solution. The best kind of tannin wine-makers can use they can extract themselves from grape pips, either fresh or of the previous season.

Bitterish is not a defect in highly coloured young wines, rich in tannin, when the taste is accentuated by the presence of carbonic acid. Malbec wines are often bitterish until matured.

Bitter is a defect, and is sometimes caused by the presence of a micro-organism. It is more often noticed in red wines, especially some high class Burgundy wines made with the Pinot grapes.

Bad tastes, as those known as as *earthy* taste, *mousy* or *foxy*, *cooked lees, wood* or *cork* tastes, and also *sulphur* smell, *hydrogen sulphide*, and foreign smells and odours will be considered separately under a chapter dealing with the changes of wine during keeping.

Sharp, sour, pricked are terms given to wines with an excess of acetic acid. These wines generally retain their colour and limpidity. The disease is characterised by the volatile odour and the taste of vinegar, which is chiefly perceived at the base of the tongue.

Milk sour and lactic.—A sickly, rancid, sour, sweet taste caused by lactic and butyric fermentations which take place in wine that has fermented at too high a temperature. A milk sour wine loses some of its fluidity, and its colour becomes dull. Pasteurising will check the disease, but it is almost impossible to take away the defect of milk-sourness.

Open Air Test.

By means of chemical analysis, microscopical examination, and wine tasting, important evidence regarding the soundness of wine is gained.

A fourth test, however, and one capable of being applied by anybody, also affords valuable information in that respect.

If wine is poured into a glass and left exposed to the air for a day or two it sometimes happens that it "breaks," showing symptoms which the French call *casse*. A change occurs in the colour, the brilliancy of the wine, and a deposit may be cast into the vessel. Should this happen it is quite likely the wine is diseased.

Wine Diseases Classified.

Broadly speaking, wine diseases may be classfied into two main groups:—

(1.) Those caused by defects inherent to the grapes themselves.

(2.) Those which invade the fermented wine after the fresh juice has been transformed into wine.

These may be subdivided again into subsections. To the first group belong the—

(*a.*) troubles and defects caused by climatic conditions;

(*b.*) those caused by insects or by fungoid diseases of the plant itself;

(*c.*) others due to defective ripening.

To the second group belong—

(*a.*) the defects due to defective fermentation;

(*b.*) the diseases caused by the agency of micro-organism;

(*c.*) those caused by the use of improper substances or unsound utensils.

CHAPMAN EXPERIMENTAL FARM.

REPORT FOR THE MONTH OF MAY.

By J. Keays.

The long spell of dry weather broke on 10th May when light rain set in, 22 points being registered. This was a much-needed and welcome fall as ploughing was carried on under difficulties, the ground being hard, consequently progress was slow. However, this beneficial rain gave an impetus to farming operations. The total rainfall for the month was 262 points. The temperature has remained very mild and on the whole favourable to the growth of cereals and grasses. The early-sown paddocks are making fair progress.

We are now busy ploughing and sowing, one team being kept constantly drilling, two other teams ploughing and harrowing. Thirty-five acres of rape have been sown for winter fodder, 5lbs. seed per acre, part of it fertilised with 70lbs. superphosphates and the balance with 80lbs. Abrolhos Island guano per acre. Have also sown 30 acres Chevellier barley and 13 acres Cape barley. This is the first English barley sown in this district, and the result is looked forward to with interest. I see no reason why English barley should not grow to perfection here, as it likes a loose soil with fair rainfall, say 18 to 20 inches per year. Climatic conditions and rainfall here compare favourably with the far-famed Goulburn Valley, Victoria, where the best barley in Australia is grown, and there is no doubt this district is eminently suited for the growth of this cereal.

The following saltbushes and grasses were sown broadcast 31st August, 1905, on sand plain, without manure, on a well prepared seed bed:—

Atriplex Semmibaccata, Atriplex Halinoides, Atriplex Nummilaria, Atriplex Holocarpa,

Mitchell Grass, Lythrus Sylvestrus, Paspalum Dilatatum, Chloris Virgatas, Hungarian Forage Grass, Sheep's Burnett, Kentucky Blue Grass.

The first three salt bushes showed a fair growth during the summer months, and are now strong healthy bushes, some of them measuring 3ft. high, $\frac{3}{4}$in. thick at base.

The test clearly demonstrates that Atriplex Holocarpa will not do on unmanured sand plain. The seed was good, as some out of the same parcel, when sown on better land and fertilised, showed vigorous growth.

All the other grasses failed excepting Sheep's Burnett, which kept green throughout the summer months; it is a slow grower and does not produce much fodder, but the test clearly proves that it is hard and deep rooted, and will thrive on poor sand plain.

One hundred and sixteen acres are now ready for the plough in No. 5A paddock; the clearing of this land was let in five separate contracts, at a cost of 18s. per acre.

During the month a two-roomed galvanised iron cottage has been erected for the accommodation of farm hands.

HAMEL STATE FARM.

REPORT FOR WEEK ENDED 2ND JUNE, 1906.

By G. F. Berthoud.

Maize.

"*Old's Old Gold.*"—Sown 21st November, 1905; germination good; growth free, even, and vigorous; foliage wide; height to eight feet; stands up well, stools freely; one cob per stalk, large and well filled; good main crop variety; harvested 10th April, 1906. Yield, 54 bushels per acre.

"*Funk's Ninety Day.*"—Sown 24th November, 1905; germination good; growth tall, to nine feet; harvested 10th April, 1906; one good, large cob per plant; fair second early variety. Yield, 32 bushels per acre.

"*Old's Mammoth,*" Flint Variety.—Sown 30th November, 1905; germination good; growth very even and healthy; height to eight feet, fairly even; cobs long and thin, much crossed, not true to type; harvested 15th May. Yield, 49 bushels per acre.

"*Grey Seeded.*"—American seed, introduced by Mr. C. Sommers, M.L.C. Sown 2nd December, 1905; germination good; growth strong; height to eight feet; grain grey, and also variagated with various shades; very distinct variety; harvested 11th April, 1906; second early. Yield, 44 bushels per acre.

THE DAIRYING INDUSTRY.

CAPABILITIES OF THE NORTHAM DISTRICT.

AN INTERESTING DISCUSSION.

At the fourth monthly meeting of the Northam Agricultural Society, held at the Mechanics' Institute recently, the President (Mr. T. H. Wilding) in the chair, a very interesting discussion took place on the question of the capabilities of the Northam district for the purposes of dairying.

The subject was introduced by Mr. J. Mitchell, M.L.A., who for years past has given a considerable amount of attention to it, and who has constantly urged that dairying could be and should be carried on in the Northam district. He affirmed that the time had come when dairying had to be done in Western Australia, and that there was no other part of the State so well prepared to take the matter in hand. The South-West had certain natural advantages, but the land there was very heavily timbered, and so far the people had not displayed so much energy in the matter of clearing as those in the Northam district. Around Northam for six or seven months they could dairy without much cost. Mr. Sweeting, at Bucklands, and one or two others, were in the habit of dairying all the year round, and last summer milk was sent daily from Northam to Perth by Mr. Dreyer without the use of ice. It would, of course, have been a much easier matter to have developed the industry when there was a duty of 2d. per lb. on butter imported from the Eastern States, but they still had a magnificent market on the goldfields and should seize it without delay. During January and February of this year £69,000 was sent out of this State for butter and milk alone. Every penny of that money should have gone into the pockets of their own producers. Northam district alone was capable of producing enough to supply the entire State. He recognised that there were difficulties and drawbacks in the way, notably the trouble of getting labour for milking, but he had no doubt that suitable labour could be obtained at a reasonable rate. One of the first things necessary was to provide as much pasture as possible. The introduction of phosphates enabled farmers to produce grasses that were impossible before. He had tried growing rape from time to time and had found it very successful. Rye grass also did splendidly in the district. They would have to face two or three bad months, but every country in the world had its bad time. In many places the cattle had to be stall-fed right through the winter, but they kept on making butter. For winter food the natural grasses of the district could not be surpassed. He believed the right kind of cattle could be procured in the Eastern States at a moderate cost. Fifteen years ago there were a great many fine cattle in

the district—principally shorthorns that had been bred there, and they were magnificent milkers as well as good beef cattle. The farmer would be able to make profit out of the butter as well as out of the calves. When in South Australia a year ago, he had visited an Adelaide butter factory and had seen the cans of cream coming in from all parts of the State. The farmers there were doing what was thought to be impossible in this State. In the height of summer cream was sent to the factory in Adelaide from Hawker, 276 miles north, where there was only a 13-inch rainfall, and a very high temperature. Other places with only an 11-inch rainfall were sending milk all the year round, and making it pay. Many of the people kept only small herds of cows, and they clubbed together to send their cream to Adelaide. The factories charged 1d. per lb. for making the butter, and they sold it for the owner on commission, and farmers away up in Hawker were getting 1s. per pound for their butter, and doing well. In Northam the farmers were much more favourably situated. They had a better rainfall, were only 60 miles from Perth, and could rely on getting at least 4d. per pound above Adelaide prices; £1,000 per day was sent away for butter, and it would be a very big thing if that money could be kept in the country. If the business could be started at once, the milk could be sold at 9d. per gallon in the winter months, and 11d. per gallon if the supply could be maintained all the year round. That was equal to over 2s. per pound for butter. People living along the Irishtown-road, out as far as Wongamine, could keep five or six cows each, and the milk could be collected daily by a cart and sent to Perth, returning a nice weekly cheque to the farmers. In addition to the direct advantages of the industry, the cow was the only animal that could put the value of the land up pounds per acre. If dairying could be established in the district, the land, instead of bringing from £3 to £7 per acre, would be worth from £7 to £10. The calves and the manure would also be of value. He urged farmers to look into the question, and try to do something, if only in a small way. The thing should be approached in a business-like way, and men could be obtained to milk a certain number of cows at a certain wage. In South Australia a man milked a dozen cows and did other work for 15s. per week. Here they would have to pay more, but the higher prices obtained for the product would compensate them. If cows could be milked at 2s. 6d. per head per week, the thing could be done profitably. The Government was going to start a dairy farm at Narrogin, and what the Government could do at Narrogin the farmers could do at Northam. He believed that in twelve months' time, if there was not a butter factory in Northam, there would, at all events, be a creamery, from which large quantities of cream would be sent to the butter factory in the city. (Applause.)

Mr. C. Sweeting said that he had been dairying at Bucklands for a good many years, and he was sure that, in a little while, people would go in for it more. While the price of chaff was £5 per ton, people did not care for the bother of dairying. The great difficulty was to get the cows milked, but there was no doubt the industry could be carried on profitably. It it was started in the way Mr. Mitchell suggested, and a cart was run in from Wongamine to Northam every morning, he would be willing to send in 20 gallons of milk per day. As for the question of summer feeding, he had tried making ensilage, with varying success. At the same time he was quite sure that ensilage could be made satisfactorily if proper pits—like those in use at Roseworthy College, in South Australia—were constructed. Dandelion and similar winter growth would make the best ensilage obtainable.

Mr. C. E. Dempster, M.L.C., thought that in the hot summer months other districts could carry on dairying better than Northam, but there was no reason why something should not be done. They might well feel ashamed at the enormous amount of money that was sent away for butter every week.

Mr. S. Solomon thought the question resolved itself into one of providing ensilage during the summer months. The price of chaff must come down, and then farmers would find it not only profitable, but necessary, to go in for dairying. In South Australia it paid farmers to milk cows when they could get only 3d. a gallon, and the price seldom rose over 4d.; therefore it would pay well here if they could get 8d. If creameries were established the farmers would get their skimmed milk back for pig feed. There was scarcely an inch of land in the district that would not grow feed for winter and for making of ensilage for summer. The making of cemented pits was merely a matter of first outlay. The pits would last a life-time. He was experimenting with summer grasses, and believed there were many that would do well in the district.

Mr. C. P. Butler said that in South Australia nine years ago, with a 14-inch rainfall, they were carting milk $4\frac{1}{2}$ miles, selling it at 4d. per gallon, and taking back the skimmed milk for pig feed. That paid the farmer handsomely, and the proprietor of the creamery also did well.

The president said the Society was under an obligation to Mr. Mitchell for the way in which he had placed the matter before them. In the past they had received such good prices for hay, grain, etc., that they were disinclined to go in for the hard work of dairying, but it was clear that the matter would have to be taken up before long.

Mr. Mitchell, in acknowledging the thanks of the President, said that he did not anticipate at the outset they would be able to milk all the year round. They could arrange matters so that their cows would calve in May, and they could milk for eight months and rest for the four dry months. Little feed would then be required in the summer, and the fallow could be kept green with rape and cow-pea. As to the difficulty of milking, this would be overcome with the perfection of the milking machine, but in any case, if their product was worth 50 per cent. more than in the Eastern States it would be a good set-off against the extra cost of labour. He hoped in the course of a month or two to have an opportunity of placing further information on the subject before the members of the Society.—*West Australian.*

WESTERN AUSTRALIAN APPLES.

LONDON OPINIONS.

IN THE FRONT RANK FOR QUALITY.

Foreseeing that the time is rapidly coming when apple-growers will have to export their surplus fruit, the W.A. Producers' Co-operative Union arranged to send a trial shipment this season, in order that the State's name as a producer of apples might be made familiar to the London trade, and that the growers might gain experience beforehand as to the methods of the export trade. For this reason, each shipper was limited to 10 cases, and all but one of the thirteen pioneer shippers sent this number. The total shipment consisted of 124 cases of apples and one case of pears, and was forwarded by the s.s. "Mongolia," on 12th March. The apples came from various parts of the State, and were chilled for two days before shipment. Some comment was made at the time about the rough handling to which the apples were subjected on the railway and on the wharf. At least one case was burst open on the railway, and had to be wired before shipment; but either the handling was not as rough as it seemed, or apples will stand a great deal of knocking about. Anyone who has seen the cases tumbled about at Hobart, Melbourne, and Adelaide realises that the latter is the case.

Efforts were made in London by the Agent General and Mr. Percy Arnold, manager of the Bank of Adelaide and of the Western Australian Bank's London agency, to secure a good advertisement for the State and let the London public know that this State is about to enter the market. These efforts were successful, and the Agent General has forwarded a number of Press clippings, which are all eulogistic in character. The *Daily Graphic* published an illustration of the fruit as it was arranged for sale in Messrs. Keeling and Hunt's rooms, Monument Buildings, London. It was perhaps a coincidence that just a quarter of a century ago this firm placed the first Tasmanian apples before the London public. The *Daily Graphic* concluded its illustrated notice by saying:—"There can be no doubt that a bright future is in store for Australian shippers, for they already appreciate the necessity of sending apples of really good quality, properly packed."

The Fruitgrower, Fruiterer, Florist, and Market Gardener concluded a column notice by saying:—"If the first consignment for sale, exhibited this week, may be taken as a criterion of the general quality of future shipments, Western Australian apples will take their place in the front rank among the shipments of apples from 'down under.'" Earlier in the article, after naming the varieties as being those best known from the other Australian States, it is said:—"For quality and freedom from disease or

blemish, these fruits compare favourable with any apples received here from Australasia, and are superior to the bulk of the shipments from antipodean ports this season so far."

When the apples were sold, good prices were realised. Eight cases failed to find a buyer the first day, and one case, reported as damp, only fetched 5s. 6d. The case of Winter Nelis pears was valueless. One case of apples went for 7s. 6d., another for 8s. 6d., and another for 8s. 9d.; but, apart from these, the prices ranged from 10s. to 23s. The latter figure was obtained by Mr. Rutherford, of Torbay, for three cases of the best Cleopatras the auctioneers had ever seen. The average price for the 124 cases was 13s. 8d., which, after deducting the average expenses from Adelaide or Melbourne, would leave about 8s. per case in the orchard. As a matter of fact, the expenses in connection with this shipment were much higher, as might be expected for a first trial lot. The London charges amounted to just about 1s. per case. Special note should be made of the remark that the jarrah cases were excellent.

The following is Messrs. Keeling and Hunt's report to the Agent General, under date 27th April:—

"Dear Sir,—In accordance with your instructions, we have made a very careful examination of the above, and we must thank you for the assistance you have given by furnishing us with copies of the letters sent to you by the Department of Agriculture at Perth, and by the managing director of the Western Australian Producers' Co-operative Union, Ltd., also for the information given to us by your own department. We are also much indebted to Mr. Arnold, of the Bank of Adelaide. We fear we have occupied a good deal of his time, but he has given us the most valuable assistance. We are pleased to be able to give you a very favourable report on the consignment, and there is no reason why Western Australia should not become the chief of the apple-producing districts. The "Mongolia" left Fremantle on 12th March and arrived at Tilbury Dock on 14th April. Unfortunately this was the middle of the Easter holidays, and practically we did not get the fruit into our warehouse until Wednesday and Thursday, the 18th and 19th. This did not give us sufficient time to send our proper notices to to the Press and the people interested, and arrange for the show that week, but we made a preliminary examination in your presence, and finding that the apples would keep sufficiently well for the purpose, we arranged that the fruit should be publicly shown on Tuesday, the 24th. As you were present, you know that the exhibition, although consisting simply of apples, was largely attended, not only by the Press, but later on in the afternoon by the principal buyers of London, and you will have seen by the comments in the papers that everything passed off satisfactorily.

Some of the apples were badly heated (kindly refer to the detailed report, wherein we deal with each shipper's parcel separately), but a large portion of the general cargo of apples was heated, and in spite of our inquiries we have been unable to trace the reason, for we are assured by the P. and O. manager that the temperature in the hold was never above 46 nor below 40, and that the average was between 44 and 45. If this was the case, we have no cause for complaint, for this average, we believe, is in accordance with the rules laid down by experts, and also in accordance with the instructions given to the engineers of the company. However, the fact

remains that the condition of a large quantity of the apples landed from this boat was more or less unsatisfactory. We will now deal with the various shippers in detail.

J. Rutherford.—Jonathans: Excellent quality and colour. Pearmains: Very good. Cleopatras: Very fine quality; one of the best boxes of apples we have ever seen.

Smith and Johnson.—Cleopatras: Very fine, clean, bright, and bold. Dunn's Seedlings: Very bold and handsome.

N.B.—This sized package (the flat case) would not be altogether popular. Please refer to our remarks concerning boxes and packing.

Sounness and Sons.—A most excellent shipment, but the Jonathans were a little spotty. Please ask Messrs. Sounness and Sons to always put their name on the box.

Godfrey Hester.—Jonathans: Very good, but many spotty. Cleopatras: Very good; rather large. Dunn's Seedlings: Very good. Pears: Too unsound to report on.

J. Whistler (10 cases Jonathans).—An exceedingly good selection of this kind of apples—in fact, we can find no fault with them. We wish this shipper had sent some other kinds in addition to the Jonathans. Please ask him to always put his name on the boxes.

M. H. Jacoby.—Jonathans: Very good indeed; few spotty. Rome Beauty: Very good. Dunn's Seedlings: Very good. Cleopatras: Fine quality; rather large. Please ask him to always put his name on the boxes.

Dean Smith (10 cases Cleopatras).—Very good quality; sizes a little mixed.

J. W. Hackett (10 cases Jonathans).—An exceedingly good selection, very much like J. Whistler's.

W. H. Smith.—Dunn's Seedlings: Very good indeed; sizes a little mixed. Jonathans: very good.

B. S. Palmer.—Dunn's Seedlings: Very good quality, mixed colours; but some of the apples were scarred (they had little rusty-looking patches). Cleopatras: Good and fair mixed; these apples were also a little scarred.

J. Allnutt.—Dunn's Seedlings: Fair quality, but too pale and rather soft. Ribstons: Very good size, but too matured for shipping and rather soft. Allnutt's Seedlings: Very good, bold (a little soft). Jonathans: very good; rather mixed sizes. Quarendon: Fair quality, but too large and soft, not like our old English Quarendons. This shipper's fruit looked over ripe.

J. J. Lyons (10 cases Jonathans).—We are sorry for this shipper, for very possibly at time of shipment his apples were quite as good as the others, but unfortunately spots had developed during the voyage, and the consignment did not arrive sound. We believe this spot is known as "bitter pit." Probably Mr. Lyons will understand what we mean by this, but we should be glad to know what the proper name is. We are, if possible, getting a photo. of some of the apples afflicted. Those that were not afflicted were very good. [It should be mentioned that Mr. Lyons was

busy with show matters and the visit of the Premier and party to the Preston Valley, and the apples were hurriedly selected and packed.—Ed.]

C. Harper (eight cases Jonathans, two cases Dunn's Seedlings).—We are also sorry for this shipper, for we should like to have sent him a good report, but unfortunately his apples were not only sorely afflicted with the disease of which we have just spoken, but they were also in very bad condition. Of course, we took care that his fruit on show was as good as possible. Both his Jonathans and Dunn's Seedlings looked as though they had been gathered too early. We have had some of these apples photographed with Mr. Lyons' fruit. If the negatives turn out well, we shall send copies to you. Mr. Harper's Jonathans were in such poor condition that we could not get a bid for them on Wednesday. Reviewing the 124 cases generally, we beg to observe that the Cleopatras and Dunn's Seedlings were splendid, but a great many of the Jonathans were soft, and some very spotty, but to a much smaller extent than those belonging to Messrs J. J. Lyons and C. Harper; Mr. Harper's apples looked as though they had been first frozen and afterwards cooked. The insides were like mashed turnips.

Date of shipment.—The apples should be shipped as soon as possible, but care must be taken to see that nothing immature is sent.

Packing.—All the apples were packed in white wood boxes, with the exception of those sent by Messrs. Smith and Johnson. This firm used jarrah wood boxes ventilated. Their apples travelled splendidly, but they consisted of the hardier kinds (Cleopatras and Dunn's Seedlings). We are rather sorry that this firm did not send some Jonathans, so that we could have made a better comparison. We note that some of the packers used wood wool. A thin layer of this at top and bottom is good. The managing director of the Producers' Union tells you, in his letter of 9th March, that his order for Tasmanian boxes had not been executed in time. We are of opinion that the Tasmanian-shaped box is the best of all, and we think the jarrahwood used by Messrs. Smith and Johnson is excellent. The Producers' Union very wisely saw that it was important to pack as nearly as possible the standard quantity. Let the shippers be very particular about this—each box should contain 40lb. net, and then we shall hear nothing about "short weight," "small size" case, "loose packing," etc., from the buyers. Some of the Lisbon tomato-packers have found out to their cost that it is not clever to send light weights. The buyers are exceedingly shrewd, and light weights are not competed for so voraciously.

Western Australia has nothing more to learn in the way of packing. The necessity of grading is understood. Let the shippers send their fruit direct to us, and we will see that their interests are protected. We have from 350 to 400 buyers regularly attending our sales, and the great dealers' businesses are situated all round our sale-room.

You have asked us to judge and award the prize offered by the Agricultural Department for the best consignment from a commercial point of view. We will do so with pleasure—indeed, we will give such an order of merit that each shipper will know the position we think he deserves, but we must stipulate that if this list is made public the detailed remarks which we have already made against each shipment must also be made public. We would not draw such a distinction for foreigners, but feeling quite certain that these shippers are bent on business and that they

prefer plain speaking, we give you the list in the order of merit, according to our judgment. It is as follows:—

1. J. Rutherford, Smith and Johnson; equal merit.

3. Sounness and Sons; very nearly equal to the above, but the Jonathans were a little spotty.

4. Godfrey Hester, J. Whistler, M. H. Jacoby, J. W. Hackett, Dean Smith, W. H. Smith; equal merit; very little inferior to the first three.

10. B. S. Palmer, J. Allnutt; equal merit.

12. J. J. Lyons, C. Harper; we ask you particularly to refer to our detailed remarks.

We trust this will be the beginning of a large and important business. We shall do everything in our power to make it successful.—We are, dear sir, yours very faithfully, KEELING & HUNT.

The following are the details of the prices fetched by the 124 cases:—

JJL—Jonathan, 10 cases, 11s. 6d. S&J, Mount Barker—Cleopatra, flat, five cases, 15s.; Dunn's Seedling, flat, five cases, 15s. 6d. G. W. Hester—Winter Nelis, pears, one case, valueless; Jonathan, two cases, 12s; Dunn's Seedling, three cases, 15s.; Cleopatra, four cases, 18s. J. Whistler (WB over cross)—Jonathan, one case, 13s.; size 1, six cases, 15s.; size 2, three cases, 14s. J.W.H., Cherrydale—Jonathan A, 4 cases, 14s. 6d.; Jonathan AA, six cases, 14s. Rutherford, Torbay—Jonathan $2\frac{1}{2}$ (1·$2\frac{1}{4}$), three cases, 14s.; Jonathan $2\frac{3}{4}$ (1·3), three cases, 15s.; Pearmain, $2\frac{1}{4}$, one case, 13s. 6d.; Cleopatra $2\frac{1}{2}$ (1·$2\frac{3}{4}$), three cases, 23s. Dean Smith—Cleopatra, 10 cases, 17s. C.H., Woodbridge—Dunn's 1 (1·2), two cases, 10s. 6d.; Jonathan 3/10, seven cases, no price; slack, one case, no price. WHS—Dunn's Seedling, five cases, 16s.; Jonathan, four cases, 13s. 6d.; damp, one case, 5s. 6d. Palmer—Dunn's Seedling $2\frac{1}{4}$-2, five cases, 13s. 6d.; Dunn's Seedling, $2\frac{1}{4}$-3; Cleopatra $2\frac{1}{4}$ (1·2in.), three cases, 13s.; Cleopatra 3 (1.$2\frac{1}{2}$), two cases, 13s. 6d.; M. H. Jacoby—Jonathan, three cases, 12s.; Rome, one case, 11s. 6d.; Dunn's, three cases, 15s.; Cleopatra, three cases, 18s. Sounness—Dunn's Seedling, grade $2\frac{1}{2}$, four cases, 15s. 6d.; Cleopatra $2\frac{1}{2}$, three cases, 18s.; Jonathan $2\frac{1}{2}$, three cases, 15s. 6d. J. Allnutt—Jonathan, one case, 12s.; Seedlings (1·2·1), 2 cases, 7s. 6d.; Ribston Pippin, one case, 13s.; Devonshire Quarendon, one case, 10s.

Mr. A. Drakard, who is exhibiting Western Australian products in England, writes:—"On 24th April I went to a show of West Australian apples at Monument Buildings, London. The consignment, which consisted of about 120 boxes, was in charge of Messrs. Keeling and Hunt, and was composed mainly of Cleopatras, Jonathans, and Dunn's Seedlings, and the following well-known growers were represented, viz., Dr. Hackett, Messrs. J. Allnutt, Godfrey Hester, Chas. Harper, M. H. Jacoby, J. J. Lyons, B. S. Palmer, J. Rutherford, Dean Smith, W. H. Smith, Sounness and Sons, Smith and Johnson, and J. M. Whistler. The Hon. W. James, Agent General, and Mr. E. T. Scammell, Emigration Commissioner, were present, and also quite a number of pressmen and other interested gentlemen. A prettier picture one could hardly imagine, and as one person remarked, 'I doubt if such a sight has ever been seen in London.' It would be invidious to particularise, and Messrs. Keeling and Hunt admitted it was a difficult matter to say which were the best. It was freely mentioned that if such fruit was a fair sample of the State's products it would pay to have a place in two or three of the largest centres of England and sell both retail and

wholesale. Mr. Scammell and I went to the store where the bulk of the cases were and had several opened, and it was a shame to find so many bad, some being quite rotten. From what could be gathered, the whole shipment by the "Mongolia" was more or less in a bad way, and Tasmania suffered severely. However, in spite of this drawback, the West Australia apples in the cases that were good fetched probably the highest prices that have ever been reached for an average selection of apples from any country. By the enclosed list you will see the majority of cases ran from 11s. 6d. to 23s. Thanks are due to Mr. Percy Arnold, of the Bank of Adelaide, who was in the State a few months ago, and whilst there made arrangements for a consignment of fruit and other products to be sent from producers, the apples upon arrival being handed over to the Agent General, who in turn put them into the hands of Messrs. Keeling and Hunt, with the result above stated. An inquiry is being made as to the cause of so many going bad, as there is not much doubt it was owing to the state of the cooling chambers of the vessel. We do not want fine fruit to be spoiled in shipment. The highest price the Tasmanian apples fetched at the same sale, and brought by the same boat, was 11s. 6d."

THE SHIPMENT TO GERMANY.

HIGH VALUES AND PRIME CONDITION.

Messrs. H. G. Barker and Co. have received the following comments, dated 26th April, from their Bremen agents, on the shipment of apples sent through them by certain growers in this State by the s.s. "Friedrich der Grosse," which left Fremantle on the 14th March last:—"We had taken occasion to advertise the apples judiciously, and are pleased to inform you that we got splendid prices. The apples at the same time, we are still more pleased to inform you, were splendidly packed, and arrived in prime condition. The grading was very good and left nothing to be desired. Our market can take any quantity of this superior fruit, and we trust you will be able to arrange much larger shipments next year. We have pleasure in handing you the enclosed price catalogue of the sale which took place here on the 25th inst. The West Australian cases, although containing from 10 per cent. to 15 per cent. net contents less than the other cases, fetched up to 21s. 6d. We are satisfied that the apples you sent are what we require for the Bremen market, and that we could easily dispose of much larger consignments at satisfactory prices if the grading is continued in the same careful manner as in this trial shipment. Account sales will follow by next mail."

It will be seen that the prices were as genuinely satisfactory as those in the larger shipment to London. With one or two exceptions, the prices realised were higher than those fetched by the apples from Victoria, Tasmania, and South Australia, and sold in Bremen at the same time, although the boxes used by those three States were larger than those used in West Australia. The following are the prices fetched by the West Australian apples in Bremen. They are stated in German currency, the

mark (100 pfennigs) being equal to 1s. The weights are stated in kilogrammes ($2\frac{1}{5}$lbs.):—

J.W.H., Cherrydale: Jonathan A, 17kg., 7 cases, 19m. 75pf.; Jonathan AA, 17kg., 6 cases, 20m.; Jonathan AAA, 18kg., 1 case, 18m. 25pf.; Munroe's FA, 18kg., 1 case, 21m.

N. and W., Jarrahdale: Jonathan A, 16kg., 1 case, 20m. 75pf.; Jonathan AA, 16kg., 3 cases, 19m. 50pf.; Jonathan AAA., 17kg., 1 case, 18m.; Cleopatra AA. 18kg., 5 cases, 19m. 75pf.; Dunn's A, 19kg., 4 cases, 21m.; Dunn's AA, 19kg., 1 case, 17m. 75pf.

S. and J., Mt. Barker: Dunn's AA, 20kg., 8 cases, 21m. 25pf.; Cleopatra A, 20kg., 1 case, 20m. 25pf.; Cleopatra AA, 19kg., 6 cases, 19m. 75pf.

G.W., Yeriminup: Jonathan A, 15kg., 3 cases, 19m. 50pf.; Jonathan AA, 15kg., 1 case, 16m. 50pf.; Jonathan AAA, 15kg., 1 case, 16m. 50pf.; Cleopatra A, 18kg., 2 cases, 15m. 25pf.; Cleopatra AA, 18kg., 1 case, 14m.; Adam's A, 17kg., 1 case, 17m.; Adam's AA, 17kg., 1 case, 16m., 25pf.; Blondin A, 16kg., 1 case, 18m.; Boston Russett A, 17kg., 1 case, 12m. 25pf.

In commenting on the information to hand, bearing on these shipments of Western Australian apples to London and to Bremen, the State Horticultural and Viticultural Expert remarks:—

Success of Trial Shipments.

"The news of the success of the two pioneer commercial shipments of Western Australian apples to London and to Germany has been much talked of by fruit-growers. The success achieved is very gratifying, but not unexpected. For several years past, trial shipments forwarded to previous Agents General in London have been reported upon by the same fruit-brokers who handled the last shipment by the "Mongolia," and been highly spoken of. As compared with Eastern fruit, ours, which was subjected to eight to ten days' shorter storage, evidently came out much fresher, as the prices recorded show.

Some Promising Markets.

"The sustained local demand on our apples will not, however, cause us to send away any large shipment for two or three seasons to come. When that time comes, improved means of cool storage will have made the safe carrying of the fruit a greater certainty still. It is also expected that the gradual reduction which has continuously been effected in the freight and other cost of handling will further expand the export trade. The cheapening of the article will put it within reach of a larger number of consumers. While our better class export apples of the size required by the European trade, viz., $2\frac{1}{4}$ to $2\frac{3}{4}$ inches in the line of the shorter diameter, will always find a market ready to absorb them, there will, besides, be a large quantity of the same kind of fruit too large for that trade, or of fruit which is not possessed of the same keeping qualities, which will need to be marketed somewhere else; and it is reasonable to expect that the busy ports of Colombo and of Singapore, which are recognised distributing centres, from which vessels trading between Europe, India, the Far East, and Japan radiate, would prove very remunerative markets. These markets, which are within 10 to 20 days' sailing of Fremantle, have not yet been

exploited with any method or system. Other markets, as well, offer for our export fruit; Egypt, for instance, with a European population of 125,000, mostly congregated at Cairo and Port Said, and with a considerable floating population crossing the Suez Canal, would be worth exploiting. I also notice, on the statement of the *British Australasian*, that, of the consignment of apples by the "Mongolia," it was expected that the largest portion would go to Paris, where high prices were anticipated. Why not send some shipments straight to France, and land the apples at Marseilles—a week's steaming nearer the consumer than if sent round by Gibraltar to London? Marseilles, apart from being a large city, is also, like the other busy ports already referred to, an important centre of distribution to every port of the Mediterranean.

"*En route* to Paris, the populous city of Lyons—the second city of France—could also be catered for at a reduced railway freight, as compared with Paris. It is thus evident that, when our system of shipping fruit is better organised, the expansion of the trade will be capable of reaching developments which it is at present difficult to realise.

"There is, therefore, every reason why we should go on planting, more especially for export. Apples, pears, and oranges take years to come to bearing, and our position is such that we have every promise, with better means of communication, of securing the world as a market, provided we only plant the right kinds. The Isthmus of Panama, for instance, when cut through by the canal now in course of construction, will assure us a vast market even in America, the largest fruit exporting country in the world, as our season happens to be diametrically opposite.

Heavy Planting anticipated.

"The planting season is now on, and from observations gathered while travelling through the agricultural districts, it is evident that our nurseries will have a busy time supplying fruit-trees for the land now ready for planting.

"A great run is being made on the recognised export kinds, and a number of trees, whose period of usefulness in supplying the requirements of the local market is now on the wane, will be grafted, and better keeping kinds substituted for them.

Spotted Fruit and Treatment.

"One word or two of caution is necessary, if we intend to capture a large export market. It is not only necessary to ship good keeping kinds of fruit, carefully graded, packed, and handled, but that fruit must be absolutely sound. In connection with the shipment of apples sent to London, the Press notices, the fruit-brokers' reports, as well as eye-witnesses, tell us that some of the apples were spotted, and their value was, in consequence, affected. To Mr. T. Quinlan, the Speaker of our Legislative Assembly, who saw the cases of apples opened on arrival in London, this Department is indebted for more precise information on the subject than has reached us through other channels, and also for a sample-box of the spotted apples picked at random from among several consignments. The apples are Jonathans, and are badly spotted, but otherwise are in excellent condition, and after two long sea trips to London and back again to Western Australia, are sound to

the core. This box of samples conveys with it valuable information, inasmuch as it supplies definite information regarding the particular disease which caused the spots on the apples.

"'Spots' are of various kinds, and the most troublesome, as well as the one least understood, is familiar to us under the name of 'bitter pit.' Some kinds of young trees, especially when planted on ground in need of drainage, suffer more than others. No very satisfactory remedy has as yet been found against that trouble.

"Then there is the disease common in storerooms, as well as in the orchards, and known as 'ripe rot.' A specific fungus is the cause of it. It more readily invades some kinds of fruit, more especially when bruised.

"Then, again, there is the 'brown rot'; and it is the one that shows in the specimens brought back from London by Mr. Quinlan. That disease is caused by a Monilia, or, as is also sometimes called, a Sclerotinia fungus. It is, fortunately, more easily guarded against than either of the previous two. As the seed spores are easily carried by rains, wind, insects, birds, and other agencies, it is important to pick, remove, and burn all affected fruit which is carried through the winter in a mummified condition, as the fruit attacked does not readily rot, but dries up either on the ground or stuck on the tree. Almonds, peaches, and plums are more particularly subject to that fungus, and disperse it freely in the spring. For that reason, 'brown rot' on apples is more common on fruit grown in mixed orchards than on fruit from orchards exclusively devoted to apples.

"The apples were picked and packed early in March for shipment on the 12th by the s.s. 'Mongolia,' and were therefore far from being too ripe, but just in prime condition for travelling.

"It is evident that the fruit brought back appeared, in all faith, perfectly sound when packed. The disease developed in transit. It is therefore necessary that, if we intend to store fruit for long keeping, or ship it to oversea markets, we must adopt means of preventing the outbreak of diseases which will depreciate its value. Spraying with fungicide must become part of the routine work of the orchard, as are ploughing, pruning, and other cultural operations. We must spray, even though to all appearance the trees and the fruit are in every respect healthy.

"For a number of fungoid diseases, and that mummifying disease called 'brown rot' in particular, a thorough treatment as follows will yield good results:—In the winter, spray with the lime, sulphur, and salt wash. This work is a good all-round cleansing one. After the fruit has set, spray with Bordeaux or with Burgundy mixture. When the fruit begins to ripen, spray with a weak solution of liver of sulphur (potassium sulphide)—$\frac{3}{4}$oz. per gallon of water—so as not to stain the fruit, which would occur if Bordeaux mixture were used. Although these sprays may be considered inconvenient or costly to apply, they will prove the means of saving a large proportion of the stored apples. The saving of half a dozen apples only in a bushel case selling at, say, 12s. per case—which is a very moderate price for well-ground and sound apples—would more than pay for the treatment. Less uncertainty would surround the business of shipping fruit to distant markets, and instead of selling a parcel of fruit at 7s. a case, which would entail a loss, the shipper should reasonably obtain 14s., which would pay handsomely."

DISTRICT NOTES.

AVON DISTRICT.

By Inspector DOBBIE.

Developmental work, which has been steadily proceeding during the whole of my term of residence in this district, went ahead with a bound on March 2nd, when burning operations were allowed to commence. In every quarter forest lands were attacked, and in a marvellously short space of time levelled with the ground and burnt up, and the selectors are only waiting for the rain to soften the ground sufficiently to admit the plough. Some contracts for clearing lots as large as 300, 250, and many of 100 acres had been let, and are, as far as possible, cropped this season, and experience has proved that new ground, if of a reasonable quality, will grow an excellent crop, so that where a selector is pressed, he is not compelled to lose a year by letting his land lie fallow.

There is no dearth of labour, and by a man who has a systematic way of going about his work, and is not afraid of it, there is really good money to be made out of these clearing contracts. There will be a marked increase in the area under crop in the district this season. On some tracks, after an absence of a few weeks, it is at times difficult to recognise one's whereabouts at a glance, as formerly. Large tracts have been cleared, fences erected; also houses of all kinds, from the modest slab-and-dab camp of one room to the more pretentious three or four-roomed iron house of some selector who came on to the land with more or less capital. Of this latter class, I have encountered not a few of late, and they are plainly in earnest. Coming either from the goldfields or from the sister States, attracted by the lectures delivered by Mr. J. H. Wilbur, or by the glowing accounts received from friends already established, they apply themselves to the overcoming of the initial difficulties and small hardships with a cheerful whole-heartedness refreshing to witness, and in this they are ably backed up by their wives and families, and it is surprising how much a family, working well together, can accomplish in a comparatively short space of time.

One instance is worth quoting:—A settler came from Victoria some time ago, selected his land, and returned to that State to complete arrangements for the transfer of his family and effects to Western Australia. He returned finally about two months ago, and when I visited him last week I found that he had sunk the post-holes (in hard ground) around two of his blocks, ringbarked 100 acres, and had burnt down and partly cleared up 12 acres, in addition to erecting a two-roomed iron house and partly fencing the site he had already chosen for his garden. Several of the older and well-established residents have had large tracts cleared this season, thus going in more truly for mixed farming, instead of retaining a large area merely as a sheep walk.

On the whole, last season's wheat returns for the district were slightly disappointing, on account of the drowning of the seed in some low-lying paddocks by the early heavy rains of May, 1905, and the later heavier rains of September.

Selection still goes on intermittently, but not quite so briskly as last year, in consequence, no doubt, of the land having been taken up as far back as 20 miles on the west and 20 to 30 miles to the east of the Great Southern railway.

Farmers, generally speaking, are exhibiting the same eagerness to acquire possession of sheep, and to this end a greater quantity of six-wire fencing is noticeable, and poison eradication is gradually engaging their attention. An impetus has been given to this feature of farming by the excellent prices realised both locally and at the London sales by last year's wool clip.

Owing to bush fires having been more general this year than hitherto, attributable, I am sorry to say, in some instances, to the extreme carelessness, amounting to indifference, displayed by selectors during burning off, summer grass has been very scarce, and many flocks have suffered considerably in consequence, but so far this trouble has not reached very serious dimensions.

The water supply, on the whole, has been good, but some soaks and wells have gone dry this summer which have not been so for years.

A good stamp of farm horse is still arriving, and the supply is more than equal to the demand. Horned cattle, however, are not receiving much attention, beyond the few cows kept for domestic purposes, nor do I think this will ever become a very important factor in the mixed farming in this district, as the average area held will not admit of it.

"Building, both in the town and all round, has been steadily going on, and the altered conditions, as compared with only a year ago, are most marked. The additions to the railway premises, in themselves very extensive, the erection of grain sheds, stores, churches, business places of other kinds, and private dwellings, all of them unmistakable evidences of prosperity, point to the fact that Brookton will, in the near future, take undisputed place as one of the thriving and important farming centres on this line.

"Several properties have recently changed hands at good figures, in one instance the seller having decided to commence sheep farming on that tract of country lately inspected by Mr. Surveyor Fox, lying east of Brookton about 60 miles, and adjacent to the rabbit-proof fence. In conversation with this selector recently, he informed me that there was ample water for his sheep, and that by exercising ordinary vigilance he was able to avert loss through the attacks of wild dogs, though they exist in fair numbers in that locality.

"Considerable business is still being done in connection with the Agricultural Bank, and it is a pleasure to again testify to the good work accomplished with its assistance. Every case dealt with by me is, of my own knowledge, that of a genuine settler, though some stand out prominently for the excellence of their work.

"In conclusion, I am able to confidently report that everything in connection with land settlement hereabout is in a thoroughly satisfactory condition. Every settler seems contented and cheerful, and the grumbler is unknown, and I have much pleasure in foretelling a prosperous future for Brookton and district."

THE AVON LAND DISTRICT.

Inspector's Report.

The inspector of lands of the Avon district reports for the past quarter as follows:—

"I beg to report for the quarter which ended on the 31st March that the harvest has been a gratifying one to practically all, The weather has been perfect both for the preservation of the crops in their final stages and for the gathering of them in. The summer has been consistently dry, but the good condition that flock-masters are keeping on their sheep is striking. Of course, stubbles are now available, but the rich indigenous grasses out east are also bearing a heavy share of the tax, and the two sources may now be seen, proving that this country is a grand pasturage. A little later on, if the rains continue to hold off till then, we shall see how lambing is managed under these circumstances. Mr. Edward Hamersley's flocks at Wilberforce lamb at the end of May. That gentleman informs me that not having early lambs is more than compensated for by the better condition of the ewes and consequent higher prices for wool. Clearing parties have all had good burns, which promises a large expansion of area under cultivation. Activity in this direction never flags. The townships are reflecting the march of settlement and development of farms. Mt. Kokeby has just blossomed out to the extent of another store and an hotel. York's new buildings maintain a more and more menacing ascendency over the old ones, while the picturesque and historic town is now a warp of telephone wires. Beverley could not do anything but grow with such good land all round it, and Greenhills has acquired a bank. The time is coming, if it has not actually arrived, when owners of good teams and implement plants will find plenty of remunerative employment here through all the seasons. As a rule, new settlers have neither horses nor appliances. Better equipped neighbours do their best for them, but they are not always equal to the emergency, and their help is necessarily untimely when it comes, for their own work must be done first. The bot-fly has been very bad in the district this summer."

NORTHAM.

The fourth monthly meeting of members of the Northam Agricultural Society was held on Saturday afternoon, when the president (Mr. T. H. Wilding) presided over a large attendance. On the recommendation of a sub-committee appointed to inquire into the necessity for amending the Bush Fires Act, it was unanimously resolved to urge the Government to issue a proclamation to the effect that, during the months of March and April, no person should be allowed to burn off in the eastern district unless he had cleared or ploughed a strip half-a-chain wide around the land he intended to burn in such a manner as to remove all inflammable matter from such half-chain. The committee of the society was instructed to prepare a scheme for the sale of the old showground, such scheme to be submitted for the approval of a special meeting to be called for that purpose. It was resolved that the annual stock parade of the Northam Agricultural Society should be held on Wednesday, 22nd August.

POULTRY NOTES.

By Frank H. Robertson.

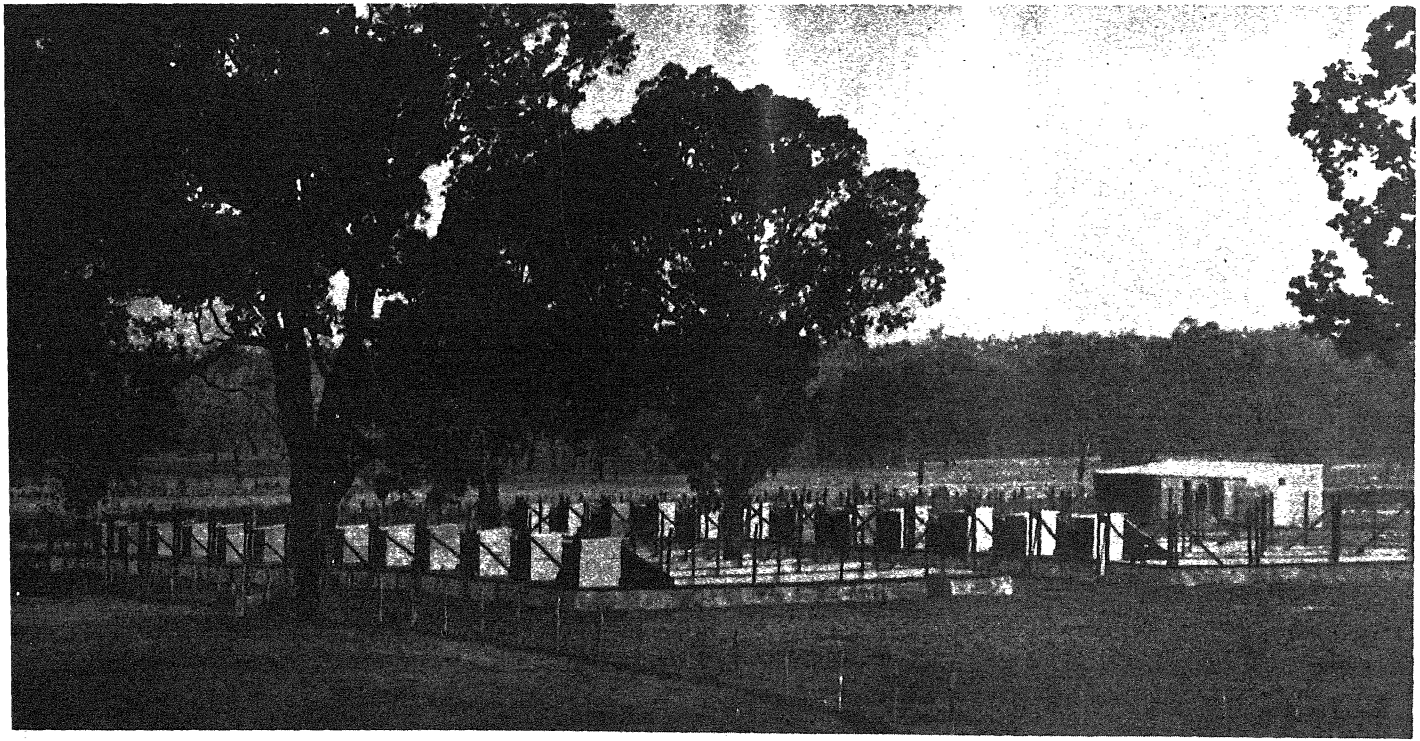
THE EGG-LAYING COMPETITION.

The Egg-laying Competition now in progress here (Narrogin) has successfully passed through the first month of its existence. The total number of eggs laid by the 25 pens of six hens each, or 150 birds in all, numbered 782, which, by comparison with the results for the first month (April) of last year's Hawkesbury competition, compares well, as strange to relate it comes out exactly at one-fourth of the result obtained by the Hawkesbury birds of 100 pens. Individual records were higher at N.S.W., viz., 122, 106, against our 102 and 104; but then they had 600 birds to pick from against our 150. However, it is at present premature to indulge in speculations as to the records at this early stage of events, still it is satisfactory to note a good start.

Miss Buttsworth's Silver Wyandottes started off with the lead, but failed to keep it up owing to nearly the whole pen going broody, three of them being so affected at time of writing; they were passed at the latter end of May by Mr. A. Bristow's White Leghorns. These birds are on the small side, fairly deep body, showing laying capacity, small in bone, good sized overhanging combs, of fine texture, very tame, at the same time remarkably active, always ready for feed, but not extra large eaters; they carry but little flesh, their food goes to eggs, which are mostly tinted in colour and extra large, none being under weight (viz., $1\frac{1}{2}$oz.); seldom is an egg laid under 2ozs. On the 19th April, six eggs were laid which scaled 13·19ozs., and on 29th, six eggs 12·81ozs.; the total weight of the 104 eggs came out at 219·48ozs., just a trifle under 14lbs., and as fresh local eggs during the month of May have been worth at retail prices quite 3s. a dozen, these six hens show a return equal to 26s. for the month, so that they have already earned sufficient to pay for the greater portion of their feed bill for the year, and yet there are plenty of people who say that poultry do not pay. It is to be hoped that egg-laying competitions will conclusively demonstrate the fact that fowls will yield a handsome profit, provided they are of a good laying strain, hatched at the right time of the year, and properly looked after.

The fowls are attended to by the writer, assisted by a student who is making a special study of poultry management. Feeding starts at 7 a.m. with a mash served warm made of bran and pollard, mixed with boiled melon or steamed lucerne chaff, to which is added boiled sheep or bullock's liver. Failing a supply of fresh animal food, a little dried meat meal is scalded and used in its place; the mash is mixed fairly moist but not sticky, and is placed on clean sheets of iron.

At mid-day, a supply of greenstuff is given, consisting of chopped maize sprouts or shredded melon, the latter being dried off with a little bran and



Egg-laying Competition at Narrogin. View of Pens.

pollard to render it more palatable; at the same time a handful of crushed grain is thrown into each scratching shed. The evening feed is given about four o'clock, and consists chiefly of good sound wheat grown on the farm, to which is added a small quantity of maize, oats, or barley fed in the scratching shed, which is kept heavily littered with straw. Care is taken not to overfeed, in fact no birds are at any meal given as much as they would eat. A handful of hard feed to each bird is the general allowance, but this is greatly reduced at times when the appearance of the birds does not warrant the giving of the usual quantity. I can call to mind instances where some of the heaviest laying pens have had but two handfuls, others again requiring much more than the usual quantity, so that no hard and fast rule can be laid down as to what quantities of food should be allowed to fowls kept in enclosed runs, the common sense and judgment of the attendant being an essential factor for success in this important part of aviculture.

The following are the Records for the first month, viz., from the 1st to 31st May:—

White Leghorns (A. Bristow), 104; Silver Wyandottes (Miss Buttsworth), 102; Buff Orpingtons (A. H. Hilton), 76; White Leghorns (C. W. Johnson), 63; Brown Leghorns (J. D. Wilson), 60; Brown Leghorns (E. E. Ranford), 52; White Leghorns (G. Oneto), 48; Silver Wyandottes (G. W. G. Lizars), 47; White Leghorns (F. Piaggio), 45; Rose Comb Brown Leghorns (Adelaide Poultry Yards), 35; White Leghorns (Aveley Poultry Yards), 32; White Leghorns (A. F. Spencer), 19; Black Orpingtons (Sparks and Binnington), 19; Silver Wyandottes (A. M. Nitschke), 16; Brown Leghorns (R. A. Dusting), 16; White Leghorns (R. G. Flynn), 15; White Leghorns (J. E. Tull), 14; White Leghorns (Miss M. A. Parker), 13; White Leghorns (O. C. Roth), 4; White Leghorns (John Hundley), 2; White Leghorns (F. J. Williams), — Black Orpingtons (Perth Poultry Yards), — White Wyandottes (Mrs. S. J. Wood), — Golden Wyandottes (W. J. Craig), — Rose Comb Brown Leghorns (E. Krachler), —

The Farm Poultry are looking well, but eggs are rather scarce; still, hatching operations are commenced, and a nice supply of early chickens is assured, consisting chiefly of Brown Leghorns and Silver Wyandottes.

The breeding pens are now completed, and consist of three pens of White Leghorns, three of Silver Wyandottes, two of Plymouth Rocks, one Brown Leghorns, also bronze turkeys, Toulouse geese, and Pekin ducks. Indian Runners are also to be kept. Special attention is being paid to improving the laying qualities of the stock, as purchases have been made of cockerels of proved laying strains, and these are mated to our heaviest laying hens. There are still for sale Silver Wyandotte and White Leghorn cockerels, and bronze turkey gobblers.

The Department, assisted by a committee of Perth poultry breeders, has arranged to hold a second egg-laying competition, which is to commence on 1st July, at the Department's grounds, situated between Subiaco and Karakatta stations. In addition to pens of fowls, ducks are also to be allowed to compete. An unusual innovation is to be indulged in at this competition, viz., the placing of male birds in the pens after the first month and the eggs sold. Hereunder is a copy of the conditions which are very similar to those governing the Narrogin competition.

DEPARTMENT OF AGRICULTURE, W.A.

SECOND EGG-LAYING COMPETITION.

To be held at the Quarantine Grounds of the Department of Agriculture, Subiaco, situated about one mile from the Railway Station, Subiaco.

Committee:—Chairman, Mr. C. F. Chaplin (Director of Agriculture); Messrs. Durham, Stuart, Byass, Dusting, Kelly, Allman, Vincent; Secretary, Mr. J. E. Lee.

The following rules are to be observed in the conduct of the "Egg-laying Competition" at the Quarantine Grounds of the Department of Agriculture, Subiaco:—

(1.) The competition to extend over the period from the 1st July, 1906, to the 30th June, 1907, inclusive; competitors to deliver their birds at the Subiaco Farm between the 20th and 30th June.

(2.) Each pen to consist of six pure-bred hens or pullets, or four pure-bred ducks.

(3.) It shall be compulsory that the owners of the first six leading pens, on the 1st August, 1906, shall place a male bird of the same breed in those pens. With other competitors this shall be optional. The price of the eggs shall be fixed by the owner of the birds and disposed of by the Department; such price not to exceed £2 2s. per dozen. One-fourth of the proceeds thus realised shall be retained by the Department, and three-fourths shall be handed to the owner of the birds. Any eggs not claimed by outside people shall be for disposal to the owner of the birds at the highest market rate. In all cases, however, the outside public shall have the first option of purchase.

(4.) Any bird found to be suffering from an infectious or contagious disease, when delivered at the Subiaco Farm, to be rejected and replaced by the competitor.

(5.) The manager shall reject any bird that is not a fair specimen of the breed entered, and such bird must be replaced.

(6.) One wing of each fowl must be cut by the owner before forwarding to Subiaco. The wing will be kept cut during the currency of the competition.

(7.) In the event of a bird dying, becoming diseased, or incapacitated from laying, the competitor must replace it with another of the same breed upon being notified. All competitors outside the 20-mile radius of Perth shall be allowed to keep two emergency birds in a pen; such pen to be provided by the Department.

(8.) Subject also to the provisions of Regulation No. 3, all eggs shall become the property of the Department of Agriculture.

(9.) Eggs under 1¾oz. in weight or otherwise unmarketable not to be counted.

(10.) Any pen, the eggs from which do not attain an average weight of 22oz. per dozen after the first three months of the competition to be ineligible for a prize.

(11.) The competition to be decided by the total number of eggs laid by each pen of birds, subject to rules Nos. 9 and 10.

(12.) The market value of the eggs from each pen to be recorded, and prizes given for the greatest total value.

(13.) Prizes will be awarded as follows:—For fowls and ducks respectively:—

For the greatest number of eggs in the twelve months:

1st prize, £7; 2nd prize, £4; 3rd prize, £3; 4th prize, £2; 5th prize, £1; 6th prize, 10s.

For the first three months (Winter Test)—Greatest number of eggs:

1st prize, £3; 2nd prize, £2; 3rd prize, £1.

For the greatest market value of eggs:

1st prize, £3; 2nd prize, £2; 3rd prize, £1.

For the greatest number of eggs during the last three months of the competition:

1st prize, £3; 2nd prize, £2; 3rd prize, £1.

For the greatest number of eggs each month during the competition:

£1 each month.

(14.) Records to be kept of the total quantities of the various foods consumed, and the average cost per head.

(15.) No competitor to be allowed to withdraw any bird until the termination of the competition.

(16.) Any competitor violating or failing to conform to these regulations will be subject to such disqualification as the Director of Agriculture, with the advice of the Committee, may think fit.

(17.) The Director of Agriculture's decision in all matters of dispute to be final.

(18.) Leg-rings indicative of competitors' entrance number will be provided.

(19.) Competitors must make their own arrangements for transit, and those within the suburban area shall deliver their birds within the Agricultural Quarantine Reserve at Subiaco, and those outside that area shall forward their birds, carriage paid, to the Subiaco Railway Station, consigned to the Manager, Agricultural Quarantine Reserve, who must be advised of the despatch of the birds. To prevent confusion, the sender must mark his or her name plainly on the coop.

(20.) Entries close at the offices of the Department of Agriculture on Tuesday, the 12th June, 1906, at 4·30 p.m. Entrance fee, 10s. per pen.

(21.) The number of pens in the competition shall be determined by the Director of Agriculture, and should entries exceed the number decided upon, the Committee shall determine the list of competitors by ballot, and advise applicants accordingly. Each competitor is entitled to enter more than one variety of either fowls or ducks.

STACK ENSILAGE.

H. W. Potts, in the *Agricultural Gazette* of New South Wales.

The present sequence of good seasons emphasises the urgency for making provision for the inevitable periods of drought with their concomitant evils and scarcity of fodder.

To conserve fodder and render it capable of remaining edible for a number of years, and to make us independent of weather conditions, should demand more than passing attention.

In continuation of the records of a crop of sorghum grown at the College Farm, and appearing in the June number of the *Gazette*, 1905, the present article is written, for the purpose of giving the details of its conservation, and the results obtained from stacking it as ensilage.

The first consideration, after having determined to select a stack as a means of conserving the crop, is to secure a site in close proximity to the milking or feeding sheds. An elevated spot is best, with natural drainage and a firm dry surface layer of soil to start on, and, if possible, sheltered from prevailing winds.

It is essential to surround the stack with a fence sufficiently substantial to prevent stock of any kind reaching the fodder. Without this, calves, pigs, horses, and cattle are always attracted; they draw out stalks all round to get at the edible portion, and by this means admit air to the stack, check the fermentative changes, and spoil it for fodder.

Our previous experience in stack building was acted upon, and we again determined to abandon the somewhat cumbersome and expensive methods usually adopted of weighting, or the application of mechanical pressure.

With this in view, it necessarily involved throughout the need for careful stacking, and a dexterous manipulation of the sheaves in laying and cross-laying them alternately, and in such a way as to secure the closest system of packing.

Apart from the object of excluding and getting rid of entangled air, the danger to obviate was the opening up of the stack through uneven settlement and shrinkage during the fermentative processes later on.

It is of the utmost importance to build each layer evenly and upwards, maintaining a regular and unbroken contour, to ensure an equal distribution of weight, so that the stack will shrink evenly and maintain its shape. The main principle to observe in all cases is to keep out the air, and to obstruct its ingress during the curing stage.

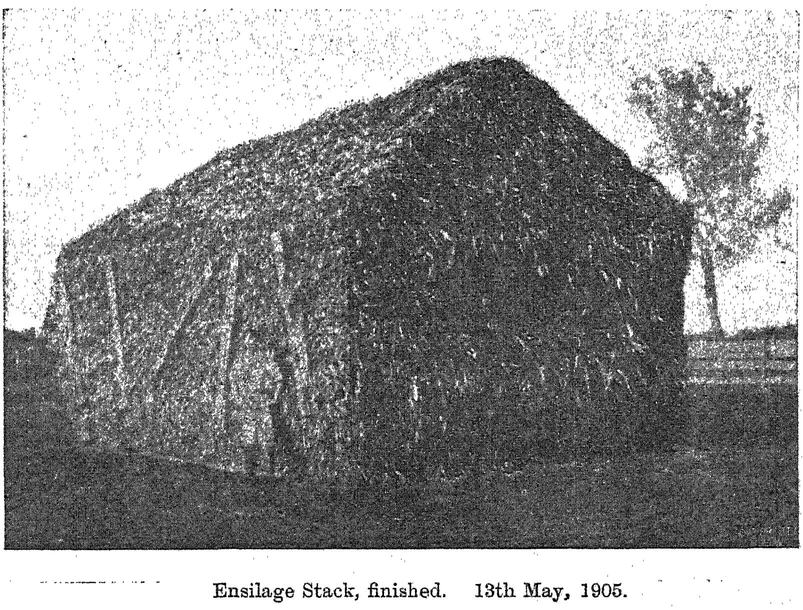
The crop was cut and brought in quickly, and stacked by hand. The stage at which it was cut was when the panicle was full of well-coloured and

Ensilage Stack early in May, 1905. Building.

completely formed seed. The plant at this stage contains the largest amount of nourishment, and the minimum quantity of water.

Ensilage Stack, nearly finished.

On completing the stack, the aim was to shape the roof so as to exclude rain and be kept intact, and resist wind. No thatching was designed or

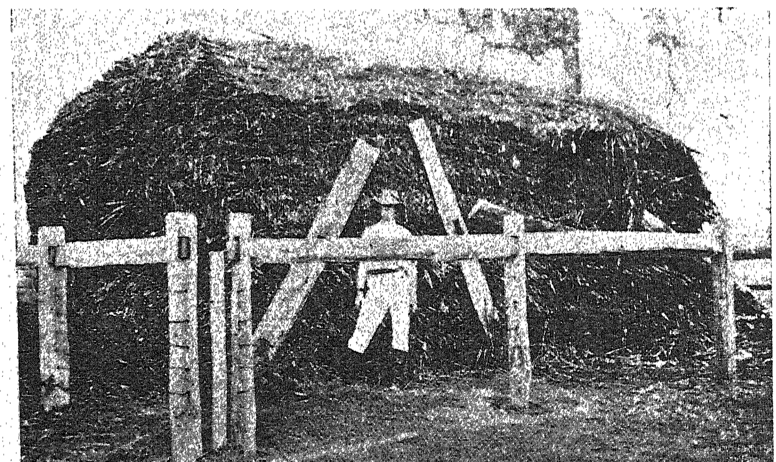


Ensilage Stack, finished. 13th May, 1905.

special material utilised. The sheaves of sorghum were laid transversely, and when the ridge was reached, the whole was kept firmly in position by passing fencing wire across every four feet, and secured on each side to heavy fencing posts hanging loose. In this way, as the stack fell, and shrinkage set in, the

Ensilage Stack, showing Shrinkage, 26th July, 1905.

fencing posts hugged the stacks closely, and kept the wires tight and in close position until the whole mass condensed, becoming solid and stationary.



Ensilage Stack just before opening, 1st February, 1906.

Shrinkage had ceased. From this out, apprehension as to its condition ended.

Stack opened.

It was approximately estimated that 150 tons of green sorghum were dealt with.

The following measurements were recorded six weeks after the completion of the stack:—

	ft.	in.
Average length of stack	27	6
" width "	20	0
Height from ground to eaves	11	0
" " " ridge	18	0
Length of ridge	24	0

From these the following volume was computed:—

		cubic feet.
Volume below eaves—		
27·5 × 20 × 11 = ...		6,050
Volume above eaves—		
Area of base, 27·5 × 20 ...	550	
4 × (mid area) (27·5 × 24) × 20	1,039	
Area at top, 24 × 0	0	
	1,580 × $\frac{7}{6}$ =	1,844
Total volume		7,894

A rough estimate of 40lb. per cubic foot being accepted, the total weight of the stack would be 141 tons.

At the end of January, 1906, this stack was remeasured when curing was complete:—

	ft.	in.
Average length	26	9
,, width	19	6
Height from ground to eaves	8	6
,, ,, ,, ridge	11	6
Length of ridge	24	0

Thus:—

Volume below eaves—

		cubic feet.
26·75 × 19·5 × 8·5 = ...		4,434 (Nearly).
Volume above eaves—		
Area of base, 26·75 × 19·5 = ...	521·6	
4 × (mid. area) (26·75 × 24) × 19·5	989·6	
Area at top, 24 × 0	0·0	
	1·511·2 × $\frac{3}{6}$ =	755 (Nearly).
Total volume		5,189

The stack was opened shortly afterwards, and as the centre was approached on 5th February, measurements were again taken to ascertain approximately the waste.

It was decided to allow for waste:—

18 inches all around the stack or the sides.
12 ,, over the top or roof.
6 ,, for the floor or bottom.

This reduced the measurements of available fodder, or good ensilage, to:—

Length	23·75ft.
Width	16·5ft.
Height from ground to eaves	7ft.
,, ,, ,, ...	10ft.
Length of ridge	21ft.

Volume below eaves—

		cubic feet.
23·75 × 16·5 × 7		2,743
Volume above eaves—		
Area of base, 23·75 × 16·5 ...	391·875	
4 × (mid. area) (23·75 × 21) × 16·5	738·375	
Area at top, 21·0 × 0	0·0	
	1,130·25 × $\frac{3}{6}$ =	565
Total volume		3,308

The exact weight per cubic foot was next determined, by carefully cutting out a cube, measuring, and weighing it; *i.e.*, the cavity from which the cube was removed was measured, and the cube weighed. This gave:—

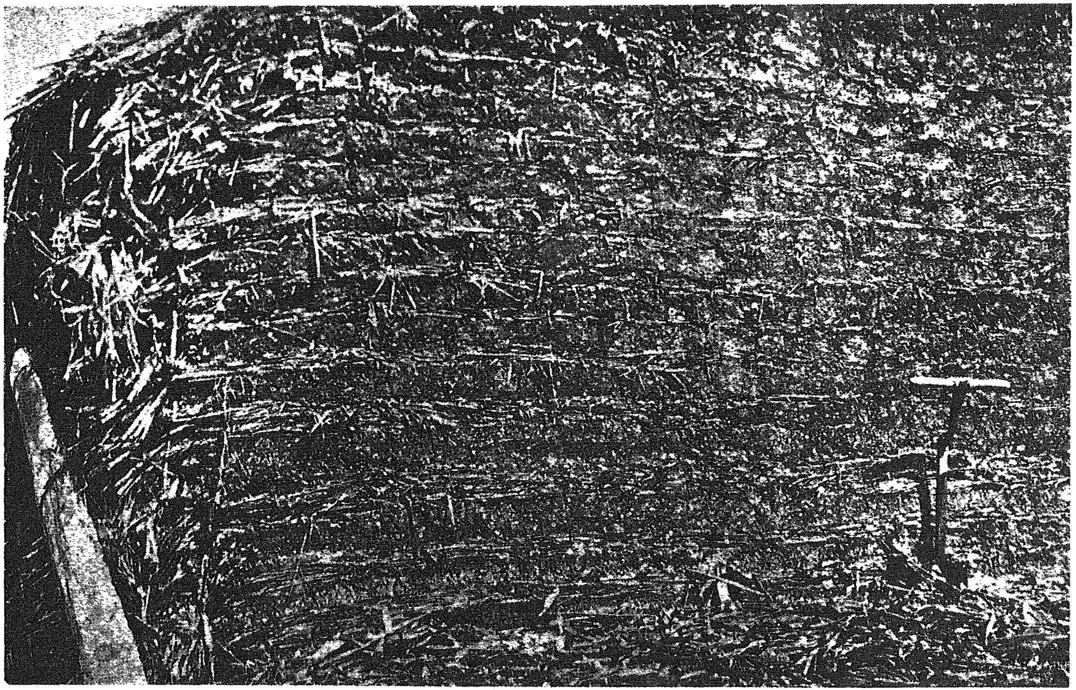
Contents of cube	6·925 cubic feet.
Weight of cube	328lb.
Weight of 1 cubic foot	47·37lb.

Using this weight per cubic foot, the total weight of the cured ensilage was

5,189 cubic ft. × 47·37lb. = 245,803lb. = 109¾ tons nearly.

Deduct the waste on the top, sides, and bottom, and we have—

3,308 cubic ft. × 47·37lb. = 156,700lb. = 70 tons nearly.



ENSILAGE STACK. View of open cut face; showing evenness of layers and uniform compression.

An examination of the waste on the bottom of 6in. showed that whilst the fodder was not equal in standard value to the other for milk cows, yet it is readily eaten by dry stock, and hence $2\frac{3}{4}$ tons may be added to the total edible silage, bringing the total to $72\frac{3}{4}$ tons.

The actual loss in food material from waste is thus noted from $109\frac{3}{4}$ tons to $72\frac{1}{4}$ tons, or a waste of 37 tons.

The loss of moisture in the curing stage being the difference between 141 tons and $109\frac{3}{4}$ tons, or $31\frac{1}{4}$ tons.

There is no difficulty experienced in cutting the silage with the ordinary hay knife.

The illustrations point to the straight, easily-cut material.

We have fed it to cows in full milk, in combination with lucerne hay and bran, the ration being—

40lb. ensilage; 15lbs. lucerne hay.

or—

40lbs. ensilage; 12lb. lucerne hay; 2lb. bran.

The cows eat this freely, and relish it. The milk flow is fully maintained.

It may be mentioned that in utilising stack ensilage, in comparison with chaffed ensilage conserved in a tub silo, the advantages are much in favour of the latter; but it often happens that convenience, time, and opportunity demand that stack ensilage shall be the means of conserving a crop.

It may also be pointed out that the larger the stack the less the waste, and hence it is more economical.

A saving may also be effected in carriage. A stack silo can be made in close proximity to a crop, and when needed, the stock can be fed direct from it.

A stack may be made of any size, and so can be built to suit the amount or weight of the crop.

THE CULTIVATION OF RAPE.

By Percy G. Wicken.

Rape is a crop that at the present time is receiving considerable attention. Settlers are beginning to realise the value of the plant for fattening sheep, and, as numerous inquiries are being made as to the method of cultivation, a few notes on the subject may prove of interest.

The rape plant belongs to the *Cruciferous* order; the generic name is *Brassica*. There are two varieties, the most common one being *Brassica campestus*. The varieties which are mostly grown are the Dwarf Essex and the Broad-leaf Dutch. The Dwarf Essex is the most successful in Australia and is the variety mostly planted.

The rape plant is a native of the temperate countries of Europe, and, although it thrives best in a temperate climate and a fairly high altitude, it grows well under a variety of conditions.

Rape is a deep-rooted plant and sends its roots well down into the subsoil and obtains its plant food from the lower part of the surface soil. This fact makes it especially valuable for withstanding periods of drought, as the roots being well down in the soil, the plants are able to obtain a supply of moisture when more shallow-rooted plants would be suffering from want of moisture.

Rape grows best in a deep alluvial soil which is well drained, and which contains plenty of decayed vegetable matter, but the plant is capable of adapting itself to more adverse conditions.

Preparation of Land.—The land should be ploughed as deeply as possible during the spring months and allowed to lie fallow in a rough condition during the summer months. During March it should be harrowed and scarified and brought to as fine a tilth as possible, so as to be ready to receive the seed with the first rain.

Fertilising.—Before giving the last harrowing, previous to sowing the seed, a dressing of fertiliser should be applied; a mixture consisting of two parts bone-dust, two parts superphosphate, one part sulphate of ammonia, and one part sulphate of potash should be applied at the rate of from 1½cwt. per acre upwards, according to the condition of the soil. This fertiliser may be sown by means of a seed drill or may be sown broadcast by hand and harrowed in. If the plants are not making satisfactory growth after they have been in about two months, or if the leaves appear at all yellow, a dressing of nitrate of soda, at the rate of 1cwt. per acre, will prove of benefit. Nitrate of soda is a highly soluble manure and its effect on the crop will be noticeable almost immediately. The best way to distribute this fertiliser is to mix it with a quantity of sand or other moist soil and then broadcast it on the soil between the rows of plants, where the fine root hairs of the plant will soon find it. If it is possible to apply the dressing just before a shower of rain it will be all the better, or if facilities are available for applying it in a liquid form, say, 1lb. of nitrate of soda dissolved in 10 gallons of water and applied round the roots of the plants the best results are likely to be obtained. The rape plant will also benefit by the application of salt where there is not sufficient salt contained in the soil. This fact makes the plant a valuable one to grow in patches of land in which too much salt is contained for cereal crops to flourish.

Seeding.—The seed should be sown in April or May, with the first rains that occur, so as to enable the young plants to get a good roothold before the ground becomes cold with the winter. Under these circumstances, the growth of the plant will be rapid and a good supply of succulent fodder will be provided for the sheep during the winter and spring months.

The seed may be either drilled in or sown broadcast. If drilled in in rows 18 inches to two feet apart, about 6lbs. of seed are required for an acre. There are several ways of drilling in the seed. If there is a large quantity to be sown, it will be advisable to obtain a turnip-sowing machine which will sow two rows at one time and mark out the drills for the next round. The wheat drill is often pressed into service for the purpose, and if two out of every three drills are closed up, a fairly good job may be made of the seeding; but

with such a small seed the results are likely to be irregular. For smaller area, the Planet Junior hand seed drill will do very good work and sow the seed evenly.

If the seed is to be sown broadcast, about 12lbs. of seed per acre will be required. The broadcasting may either be done by hand or by Messrs. Hunt & Co's. broadcasting seed barrow. This sows a strip of land 12 feet wide each round, and a man can get over from 12 to 20 acres per day. This simple machine can be set to sow any quantity of small seed (such as rape) from 1lb. per acre upwards.

If it is not possible to have the ground ready to sow the rape seed in April, it may be sown later with varying degrees of success, according to the season, but the best results are obtained by the early-sown crops.

Rape seed is not expensive, although the increased demand has raised prices. It can be obtained in quantities at from 28s. to 30s. per cwt., and in small lots from about 6d. per pound. The cost of seed per acre is, therefore, very light.

Cultivation.—Apart from the saving of seed, the system of sowing the plants in drills is a good one, as it enables the subsequent cultivation to be carried out in an economical manner. As soon as the young plants appear above the ground the weeds must be kept in check. When the crop has been sown broadcast, this entails a lot of labour, as the work must be done by hand or with a chipping hoe. When the crop is sown in drills horse cultivation may be used. A light horse attached to a Planet Junior cultivator will get over a lot of ground in a day. As well as keeping the weeds in check, the cultivation keeps the soil between the rows well stirred, and thereby helps the plant to make a better growth.

The Feeding Value.—The following table shows the value of rape as a fodder for stock. The value is due to the amount of protein it contains. The result of some analyses made at the Minnesota Experimental Station, U.S.A., are:—

Rape.	Water.	Composition of Dry Matter.		
		Ash.	Protein.	Fibre.
	Per cent.	Per cent.	Per cent.	Per cent.
Entire plant nearly mature	84·51	7·60	11·75	15·29
Leaves	88·16	7·50	17·04	11·06
Half-grown	92·48	9·24	12·44	...
Nearly matured	86·46	9·68	12·14	...
First stages of growth	95·11	16·48	14·76	10·38
Matured plant	76·44	8·01	9·21	12·03

The dry matter of the rape plant contains about as much protein as clover hay.

Rape makes a most excellent fodder for both sheep and pigs, and, in conjunction with other fodder, is used extensively for dairy cattle. When

feeding sheep on rape, the best method is to turn the sheep into the crop and let them graze on it; but in this case it is necessary that the sheep should be turned into the crop with full stomachs, so that they can only eat a little of the plant at first. If turned on to the crop when in a hungry state they eat a large quantity of the green leaf, and when this begins to decompose gasses accumulate in the stomach, and many losses often occur. If turned in with full stomachs they eat slower and become gradually used to the feed.

When feeding sheep on rape, it is a practice generally adopted to supply in a feeding-box or trough a quantity of dry chaff, which the sheep will eat with the rape, and this will help to prevent any bad effects from the succulent food.

In turning sheep on to a rape crop, they should not be allowed to roam over too large an area at one time. Where sheep are fed on cultivated crops, it is a good plan to have a number of small paddocks, so that as soon as the crop is eaten down the sheep can be removed to another paddock, and the one left be given a chance to recover. After a few weeks' rest the first paddock will have grown up sufficientiy for the sheep to be turned in again; whereas if the sheep are allowed to wander over a large area, they will destroy as much as they eat, and the plants will not do so well if the hearts are continually nibbled at. To obtain the best results from the plants, the sheep should be removed when the plants have been eaten down to within two inches of the ground. A very good way to carry this out is to have a portable hurdle fence constructed which can be shifted a few chains whenever required. By this means the sheep can be given just as much of the crop as they can profitably consume, and the eaten crop left to make a fresh growth. Under these conditions, the crop can be fed off three times during an ordinary season. I have known an acre of well-grown rape to carry from 30 to 40 sheep for a month at a time when kept in by hurdles, and to convert them from store condition into fats; a few weeks after the rape was fit to feed off again.

This method of growing rape and feeding off by sheep is a splendid one for improving the ground. The rape plant, being a deep-rooted plant, obtains a large proportion of its food from the subsoil. The plant is consumed by the sheep, and the bulk of its contents returned to the surface soil per medium of the droppings of the sheep, and the crop following the rape is generally a very heavy one; in fact, there is no better way of improving the soil. As well as the manure from the sheep, the roots and all the residue of the plants are returned to the soil.

Feeding Pigs.—Rape makes an excellent feed for pigs. They can be turned in to graze on the rape the same as sheep, and young pigs can be fed on a crop of rape and kept in good condition until they are large enough to bring in and top up for market. Where it is not convenient to turn the pigs on the crop—and it is not advisable to do so where sheep are likely to be on the same crop—a quantity can be cut and carted to the pigs every day. Pigs can be kept in good store condition and in good order for stud purposes on rape alone.

Feeding Cows.—Rape, in conjunction with other fodder, is largely used for dairy cattle, but is particularly valuable for mixing with other food to

make silage. When mixed with vetches, oats, and rye it makes a highly nutritious and valuable silage. When fed to dairy cows in a green state it should be allowed to remain in the field for 24 hours after cutting, so as to allow it to wilt. When this is done it is not so likely to taint the milk as when it is fed in a fresh condition. It should always be fed to cows immediately after milking; not before the cow is milked.

Cattle should never be turned on to a crop of rape or allowed to consume large quantities of the plant unless the leaves have been well wilted in the sun, as it soon causes Hoven or Blown, caused by the accumulation of gasses in the stomach, and if not treated in time this soon causes the death of the animal.

Apart from the value of the leaves of the plant for purposes of feeding stock, the seed is a very valuable product, and in Europe the plant is largely grown for the seed alone. The seed, when ripe, is collected and pressed; the oil obtained being known as Colza Oil, and which is used for a number of purposes. The residue, after the oil is extracted, is pressed in a cake. This cake, which still contains about 10 per cent. of oil, is sold as rape-seed cake, is largely used for feeding stall-fed cattle in the colder countries. The manure obtained from animals fed on rape seed cake is a very valuable one. The cake is rich in both nitrogen and phosphoric acid. The cake, when the price is low, is often used as a fertiliser by itself, and is valuable for land which is deficient in humus. From 4 to 5 cwt. per acre is the quantity used as a fertiliser.

Green Manuring.—For soils deficient in humus and which will benefit by the addition of vegetable matter, rape is one of the best crops that can be grown; a crop of rape ploughed into the soil will improve it very considerably. Leguminous crops are largely used for this purpose, on account of their being able to obtain their nitrogen from the air. The rape plant, owing to the deep growing, searching nature of its roots, obtains a great quantity of its food supplies from the subsoil, and when the crop is ploughed in and the humus decomposes, this food is available for the following crop and increases the yield very largely.

A method often adopted is to sow a few pounds of rape seed with the wheat crop which it is intended to harvest with the stripper. The rape plant grows among the wheat, and when the sheep are turned into the stubble affords them a splendid supply of food. This method could not be adopted where the wheat is cut for hay, or where the binder is employed to harvest the crop. Better results would, no doubt, be obtained by cultivating each crop separately.

EXPORT OF HONEY.

A SCHEME SUGGESTED.

SPEECH BY THE PREMIER.

DEPUTATION TO THE GOVERNMENT.

A conference of beekeepers was opened in the lecture hall of the Department of Agriculture on the 12th inst. Mr. J. N. Shipton presided, and among others present were the Hon. the Premier (Mr. Moore) and the Hon. member of the Government administering the Department of Agriculture (Mr. J. Mitchell). The report of the proceedings is taken from the daily Press.

Speech by the Premier.

The Premier said he understood that the industry had reached that stage when the production of honey exceeded the local demand, and that the conference intended to make certain proposals to the Government regarding the exportation of the product. He assured them that the proposals which they placed before the Government would receive every consideration. From information which had been placed in his hands, he noticed that, in 1904, honey of a total weight of 212,841lbs., and valued at £3,138, was imported into the State, and that for the first four months of 1905 the honey brought into Western Australia amounted to 248,640lb., valued at £3,460. It was very apparent, therefore, that something must be done to assist the local industry. His colleague (Mr. Mitchell) would be present at the conference for some time, and he felt sure that that gentleman would give every consideration to any representations made to him.

Premier Congratulated.

Mr. M. Jacoby, in moving a vote of thanks to the Premier, congratulated him upon the position which he had attained. He wished to assure him that the producers in the State were looking forward with great confidence to good work being performed by the present Ministry, not only for the producers, but for every other section of the community. Mr. Moore commanded one of the strongest Ministries in Australia at the present time. A definite policy with regard to agricultural development was badly needed, as in the past few years those in charge had had rather obscure ideas as to what was the best method of developing the various industries. He was pleased to find that attention was being given to beekeeping, poultry-raising, etc., as these industries were profitable if carried out properly. He hoped that Mr. Mitchell would be able to make arrangements whereby a few tons of local honey could be placed on the London market. If that were done, however, beekeepers would owe a duty not only to themselves, but also to the State, and that was to see that honey only of the very best quality was sent away. He understood that some of the difficulties which had been experienced in the industry were due to beekeepers trying, in cases, to put on the market honey of a poor quality.

The motion was carried unanimously.

Mr. Moore's Reply.

In reply, the Premier said he hoped that the people of Western Australia would have no occasion to regret that the present Government held the reins of office. All their interests were centred in the State, and if it went ahead they would also progress. If the country fell back, they too would fail. It was to their own interests, as well as to the interests of the State, that they should do all they could to make the State go forward. He recognised the necessity there was for farmers throughout the State devoting what attention they could to pig and poultry raising, etc., which matters Mr. Jacoby had referred to. He was pleased to know that the inclusion of Mr. Mitchell in the Ministry had met with their approval. (Applause.) Mr. Mitchell had had a wide experience in connection with farming, and he felt sure that his advice would always be of the greatest possible value. (Applause.)

The Premier and Mr. Mitchell then left the Conference.

An Export Market.

Mr. F. H. Layton stated that in the course of a communication submitted to the Director of Agriculture he had pointed out that the beekeeping industry had arrived at the stage of its existence when more honey was produced than the State could consume. On the top of that there was the importation of cheap grades of honey, and it was very questionable whether other articles, such as glucose, etc., were not brought in under the guise of honey. This importation of honey had caused the market to become glutted. In fact, the whole industry was in danger of being practically extinguished. Many beekeepers were talking of giving up, as there was no sale for the honey they had on hand, and they were losing money. The only hope of saving the industry was by finding a suitable export market. This could only be brought about by organisation, and the expenditure of capital, as when consignments were sent to London in the ordinary course the merchants there, knowing that the honey came from Australia, described it as "eucalyptus honey," and said it had a "strong eucalyptus flavour, which the people did not like." They condemned it in order to obtain it at a very low price, not offering more than £18 per ton, at which price it would be impossible for the producers in the State to sell the honey and obtain a living. That very same honey, however, was sold to the consumers in glass bottles with English labels at from 8d. to 1s. per pound, and the consumer did not know the difference. Producers should market the honey themselves until such time as it had the name which it deserved, and it would then be placed in the front rank. After consultation with a number of beekeepers, he had been asked to present a scheme whereby they could market their honey in England, and probably elsewhere, at a price which would save the industry from extinction, and, furthermore, place it in such a state that thousands of pounds would, as a result, be brought into the State annually. The accompanying scheme was, of course, open to alteration by the Conference.

The beekeepers should form themselves into a co-operative association, and should establish a main depôt in Perth, through which all honey should have to pass for grading, etc. A good, practical beekeeper, with business ability, should be sent to London to work up the trade, and the West Australian Government brand should be placed upon each tin sold there, as a guarantee of its purity. As the scheme developed, other possibilities and details would present themselves. For instance, orders in bulk or otherwise

could be placed on the Continent through our agent in London. The main obstacles in the way were organisation and finances, and it was only by the help of the Government that a start could be made with the scheme.

Aromatic Honey.

Mr. W. C. Grasby said that Australian honey was a real aromatic honey, and should be sold in London as such. He had heard of people in England who had expressed themselves as being delighted with the honey because of its aromatic flavour. He did not wish to be unkind, but it was a fact that the people in the Eastern States, who were accustomed to the red-gum and peppermint flavour in honey, disliked the flavour of the locally-produced honey. Local producers, however, must put forth the flavour of their product as its virtue. (Hear, hear.)

Mr. J. A. Ayres then moved—"That the time has arrived when we should export our honey."

Mr. Layton seconded the motion, which was carried unanimously.

A sub-committee was then appointed to discuss the proposal submitted by Mr. Layton.

Recommendations.

The Committee, having gone into the matter, submitted certain questions for consideration, and the conference decided to make the following recommendations:—

1. It was resolved that the Government be asked to purchase, as a trial shipment for London, 20 tons of honey at 3d. per lb., to take delivery in Perth.

2. It was recommended that the honey be accepted in either the clear or candied form, to be delivered at the Perth railway station in 60lb. tins. Beekeepers to use honey or kerosene tins at their own discretion, and to take all risks as to the condition of the honey upon arrival in Perth.

3. On the question of the preparation of the honey for export, it was decided to suggest that 2lb. tins should be used, the Government expert to exercise his discretion as to whether or not limited quantities should be in glass jars.

4. It was resolved to recommend that the honey be classified by the Government expert, and labelled according to the trees from which the honey was obtained, and that all beekeepers, except those who strained honey, should have an opportunity to dispose of honey to the Government for export, according to the number of their hives.

5. It was decided to recommend that a person accompany the shipment from Perth to London, and market the honey upon arrival.

A Deputation.

It was then decided to wait upon the Government at 10·30 a.m. the following morning, with the request that the recommendations as formulated by the Conference should be followed out as closely as possible.

Cost of Shipment.

It was stated that the cost of the trial shipment of honey would be £1,020 13s. 4d., made up as follows:—Cost of 20 tons of honey at 3d. per lb.,

£560; probable cost to cover all expenses, £460 13s. 4d. Against this was the sale of honey at an estimate of 6d. per lb., or a total of £1,120.

THE DEPUTATION TO THE MINISTER.

The deputation to the Hon. the Minister for Agriculture was introduced by Mr. Ewing, M.L.A.

Mr. J. Sutton (Hamel) pointed out that, if anything was done, it should be carried out from start to finish by themselves. They should have nothing to do with the English honey market. He had no doubt that the honey that could be sent from this State would compare favourably with any sent to England to-day. Since the conference was held he heard that Canada was sending more honey to England now than ever before, and better prices were being obtained. He had also been told that there was a large market open in India, with a guarantee, so his informant said, of 6d. per lb.

Mr. Mitchell: How is it that honey can be brought to Fremantle from other States at 2½d. per lb.?

Mr. J. N. Shipton (Subiaco): It is third or fourth grade honey, which would be used, if produced locally, in tobacco factories.

Mr. Mitchell: Our total production is 200 tons per annum, I understand.

Mr. Sutton: In a good season it is 240 tons.

Mr. Mitchell: In this proposal it is suggested that the Government should pay you for the honey at the rate of 3d. per lb. Can't you get that on the local market?

Mr. Sutton: No; because the market is simply glutted.

Mr. Mitchell: Is it necessary, in furthering this scheme, for the Government to buy this honey? If you have wool or sandalwood for shipment, you simply get the bank to advance against it.

Mr. Sutton: That is when dealing with men in a position to wait for the balance. We, as bee-keepers, are struggling.

Mr. Mitchell: That is what I want cleared up. It is necessary for you to have what you consider a fair value straight away?

Mr. F. H. Layton (Donnybrook): A lot of us have got three years' stock in hand now.

Mr. Mitchell: You suggest that a special agent should be sent from here to place the honey on the market, and your Association wants to nominate the man to go home with the shipment?

Mr. Layton: If it had to take care of itself it would simply go the way of other shipments.

Mr. Mitchell then congratulated the conference upon the fact that there was some sort of co-operation amongst bee-keepers. If there was the same co-operation in other industries they would get some development work done. He was entirely sympathetic. He wanted to see production encouraged in every direction, and there was nothing too small that could be done to bring this about. They had already assured him of the purity of the honey, and of the fact that they could incresase the production to meet any expanding demand. They were important facts. To a business man it did seem strange that the public should be willing to take inferior honey from other States at 2½d. per lb., rather than theirs at 3d. per lb., because the public were, as a rule, fair judges of quality; but it appeared that even

if they did take the whole of their honey they would still have to find a market elsewhere. Of course, that was the great argument in favour of it, although he might have something to say about the price they wanted the Government to pay for their honey. He had no money at present, but he would give the matter every consideration, and he had no doubt that they would find means to get their 20 tons to London, especially as it was in hand now. It struck him that if they could make a house-to-house canvass in London, surely they could do it in Western Australia. However, he would go into the question, and he hoped to be able to assist them. (Hear, hear.) He was seriously in earnest when he said that he had every desire to help every producer in the State. They could not give them a bonus, but they could do something else. (Hear, hear.)

At the conclusion of the deputation proceedings, Mr. J. N. Shipton (President of the Bee-keepers' Association) asked the Minister if he would renew the grant of £10 which they had enjoyed up to three years ago, but which was overlooked during a change of Governments. The money kept alive the Association, which did good work for the industry.

Mr. Mitchell: I can promise you that. (Hear, hear.)

GOVERNMENT LABOUR BUREAU.

MAY REPORT.

The following is the report of the Superintendent (Mr. J. Longmore) on the operations of the Labour Bureau for the month of May, 1906:—

Perth.

Registrations.—The total number of men who called during the month in search of work was 773. Of this number, 457 were new registrations, and 316 renewals, *i.e.*, men who called who had been registered during the year prior to the month of May. The trades or occupations of the 773 applicants were as follow:—Labourers, 216; handy men, 81; handy lads, 79; farm hands, 60; cooks, 34; bushmen, 30; carpenters, 21; horse-drivers, 16; grooms, 16; engine-drivers, 15; fireman, 14; gardeners, 10; clerks, hotel hands, and miners, 9 of each: blacksmiths, fitters, and kitchenmen, 8 of each; bricklayers, engineers, and painters, 7 of each; bakers, butchers, carpenters (rough), dairymen, orchardists, and survey hands, 6 of each; barmen, grocers, and orderlies, 5 of each; electricians, seamen, strikers, station hands, and yardmen, 4 of each; bakers, joiners, and tailors, 3 of each; and 29 miscellaneous.

Engagements.—The engagements for the month numbered 241. The classification of work found was as follows:—Labourers, 79; farm hands, 40; bushmen, 32; handy men, 11; handy boys, 10; cooks, 8; gardeners, 8;

boys for farms, 6; carpenters, 6; quarrymen, 4; stokers, 4; dairymen, 3; grooms, 3; groom-gardeners, 2; drivers, 2; shepherds, 2; woodcutters, 2; and 19 miscellaneous.

Fremantle.

Registrations.—The applicants for work numbered 89. There were 57 new registrations, and 32 renewals.

Engagements.—The engagements numbered 7, classified as follow:—Handy men, 3; handy lads, 3; and cook, 1.

The female servants who called numbered 3. There were no engagements.

Kalgoorlie.

Registrations.—There were 57 new registrations, and 44 renewals.

Engagements.—The engagements numbered 16, classified as follow:—Labourers, 11; clerks, cooks, carpenters, engine-drivers, and grocers, 1 of each.

The female applicants for work were 49. There were 28 new registrations, and 21 renewals. The engagements were 3, viz., cook, general, and waitress.

Women's Branch, Perth.

Registrations.—The women who applied for work numbered 196. There were 122 new registrations, and 74 renewals. The classification was as follows:—Generals, 34; housemaids, 30; cooks, 26; laundress-charwomen, 26; light generals, 19; useful girls, 12; housekeepers, 12; waitresses, 12; cook-laundresses, 6; nursemaids, 5; ladyhelps, 4; and 10 miscellaneous.

Engagements.—The engagements numbered 74, classified as follow:—Generals, 24; laundress-charwomen, 19; light generals, 11; useful girls, 5; cooks, 4; cook-laundresses, 4; and 7 miscellaneous.

General Remarks.

The number of individual men who called at the central office, Perth, during the month was 773. This is 108 in excess of the number for April, and 87 less than that for May last year. The engagements were 241, being 24 in excess of the number for April, and 31 less than the total for May last year.

At the Women's Branch, Perth, 196 women called during the month. As compared with the previous month the number is 50 in excess, and 13 less than that of May last year. The engagements were 74, being 8 short of the number for April, and 26 shorter than that of May last year.

THE USE OF WASTE ORGANIC SUBSTANCES AS MANURES.

By Edward J. Russell.

There are several ways in which a manure may be beneficial, but in general most manures serve one or more of four purposes, which are :—

(1.) To increase the supply of plant food, either directly or indirectly, through the solvent action of the soil.

(2.) To improve the mechanical condition of the soil.

(3.) To hold up water in the soil and so ensure a constant supply for the plant.

(4.) To favour the growth and work of micro-organisms on whose activity the productiveness of the soil to a certain extent depends.

Mineral substances, with the exception of lime and basic slag, chiefly serve one function only, supplying plant food; but organic substances, like dung and the products described in the following pages, act beneficially in all the directions enumerated above. They furnish plant food, but the proportions are not well balanced, and somewhere in the rotation the proper mineral substances have to be added if the best results are to be obtained. They have a marked effect on the mechanical condition of the soil: a heavy soil is lightened both by their mere presence and as a result of their decay; and a light soil is improved by the cementing action of the glue-like colloidal humus to which they give rise. A good tilth is difficult to secure without organic matter.

One of their most valuable properties, and one in which they far surpass artificial manures, is their remarkable power of holding water. The water supply in many soils is insufficient for securing maximum crops; the manuring and cultivation adopted would give much better results if more water were present, provided, of course, it had no depressing effect on the soil temperature and air supply. This question will assume even greater importance as the necessities of the towns compel them to sink more and deeper wells in the country. Already in many districts the water level is lower than it was; shallow wells are in consequence left dry and have to be deepened, and the supply available for the fields promises to be still further curtailed. Proper cultivation and the application of organic manures are two good ways of conserving the water supply.

Organic matter is not indispensable; crops can be grown on an experimental scale without it. But the advantages of having some present and of replacing it as it disappears from the soil in consequence of bacterial and other actions are well recognised; the farmer uses dung, and the manure manufacturer frequently puts organic matter into his compound fertilisers.

There are a number of waste products, used at present only in special branches of farming, some of which deserve a more extensive trial. This paper deals with certain substances used in the hop gardens of Kent and Surrey, but there is no fundamental reason why their use should be restricted to hops, and the writer has seen some of them applied with great

advantage to other crops. Nor is their use confined to a particular type of soil; they are generally applied to light chalky or sandy land, but this is by no means essential.

There are, however, certain drawbacks with regard to purchasing. The supply is somewhat irregular, and bulks are often not uniform; it is difficult to draw a representative sample for analysis, and dealers often decline to give any guarantee as to composition. Competition from other quarters may force prices up too high, difficulties attendant on sanitary regulations may do the same, or they may act in precisely the opposite direction. There is no uniformity of price; indeed, prices vary in neighbouring districts in an apparently haphazard way, and the personality of the buyer is an important factor. Little information is obtainable as to the relative manurial value of the various substances; the usual pot experiments are not quite satisfactory, because sufficient account can hardly be taken of the power to hold up water. It seems certain, however, that, provided the mechanical condition is satisfactory, these substances have more value than our text-books would have us believe.

The prices quoted in this paper are those which the practical hop-grower in a position to make favourable purchases finds it worth his while to pay.

The substances dealt with fall into three groups:—

(1.) Residues from animal carcases: Dried blood, feathers, greaves, hair waste, hoofs and horns, rabbit waste, slaughterhouse refuse.

(2.) Residues from manufactures: Damaged cakes, shoddies, tannery waste.

(3.) Residues from towns: Destructor refuse, night soil, poudrette, sewage sludge.

1.—Residues from Animal Carcases.

Dried Blood.—Without doubt this is an excellent fertiliser, and it is used by some manufactures for their mixed manures. The price at which it is offered to farmers appears usually too high, in consequence, it is understood, of competition from America and the Continent. Thus, a sample yielding 12 per cent. of ammonia was offered at £8 delivered in Kent, which works out to a unit price of 13s. 4d. The latest quotations seen have been even higher.

Feathers and Feather Waste.—Excellent results are obtained in some hop gardens by using about 20 to 25 cwt. of feathers, and the limited supply (amounting probably to only a few hundred tons a year) is rather keenly sought after. Large feathers are slow in action, the shafts especially taking a long time to decay; a sample containing many of them is not as valuable as one composed mainly of small, more easily decomposable feathers. The ammonia obtained is usually a little over 10 per cent., a not uncommon price being £5 per ton delivered, giving a unit price of 10s. In spite of the generally good mechanical condition, one cannot help thinking this is too high. The price naturally fluctuates; farmers have been known to pay £5 15s., while samples have also recently been offered at 70s. to 80s. At these lower prices, where the unit value is 7s. to 8s., feathers must be considered cheap.

Greaves.—Etymologically this word is the same as "gravy;" it denotes the refuse or sediment left in making tallow or soap grease. Clean samples, derived from butchers' fat and the trimmings of joints, are used as food for

dogs, pheasants, and poultry; lower grades, obtained in melting down grease from other sources, are available as manure, and have been effectively used on hops, fruit, wheat, and other crops. The composition varies, and the fluctuation in price is considerable, 50s. to £8 being perhaps the outside figures, but it is not difficult to fix a maximum value for a particular sample, because of the close relationship between greaves and meat guano. The latter article consists of well-dried and finely-ground greaves mixed with bone meal; as a manure it is superior to ordinary roughly-ground greaves, and a higher price may reasonably be paid for the ammonia it yields. At present meat guano is being offered in Kent and Surrey at 10s. to 13s. per unit for ammonia and 1s. per unit for phosphate; it should be used in preference to greaves unless there is a distinct difference in price. The prices asked for greaves are sometimes excessive: a sample yielding 5 per cent. of ammonia and 5 per cent. of phosphate, and worth, on the above basis, from 50s. to 55s., was offered to the Wye College at £5! No doubt the varied uses of greaves as food, for meat guano, and as an ingredient of certain mixed manures had to do with the high price, which was asked in good faith by a local dealer.

Hair (Calf Hair, Hair Waste).—This yields about 12 per cent. of ammonia, but it does not easily decompose in the soil. As a rule the mechanical condition is very bad; the hair is matted in lumps which resist all ordinary farm appliances, and absolutely refuse to break down. They may be in the soil for an indefinite time without perceptibly diminishing. I have known calf hair remain for two years in a hop garden, and at the end of that time still yield 12 per cent. of ammonia when brought to the laboratory.

Having regard to its unsatisfactory mechanical condition, hair must be valued at less than feathers, and much less than meat guano. I am inclined to think that 4s. or 5s. per unit of ammonia is fully as much as it is worth; this would make its value about 50s. or 60s. per ton. At the same time, if it could be supplied in a finely divided state it would be worth more; as it is, a higher price is often paid for it.

Hoofs and Horns.—The value of these is regulated mainly by their fineness; high-grade samples of horn shavings and finely-ground horns yielding 15 to 17 per cent. of ammonia are largely used by market gardeners. On the other hand, *whole* hoof and horns and materials like trotter scutch (consisting of hair, hoof, and bone), sometimes bought by farmers, are of little value until they have been finely ground.

Rabbit Flick (Rabbit Waste).—This consists of the ears, feet, tail, and various other portions of the outside of rabbits. The mechanical condition is usually very fair, but if the substance could be broken up a little more its value would be increased. It yields from 13 to 15 per cent. of ammonia, and sells at about £6 per ton; the unit value of the ammonia is therefore about 8s. A certain amount of phosphate is invariably present. Rabbit waste is regarded by many practical men as quite a useful fertiliser; its only drawback is that the supply is rather restricted.

Slaughter-house Refuse, Viscera, etc.—The proper way to utilise slaughter-house refuse is to convert it into meat meal or guano, in which form it can easily be carried about without interference from sanitary authorities. Where those who contract to clean out cattle markets have the refuse removed in barges it finds its way to waterside farms. It is worth about the same price as town stable manure.

Waste Fish.—East Kent farmers are very partial to waste fish as a manure, and the loads of sprats and of "five fingers" occasionally obtainable are disposed of without difficulty. Its use is not confined to hops; I have seen it applied with great advantage to mangolds. Owing to its particularly penetrating and unpleasant odour it is, as a rule, only available in districts directly connected with the sea.

Fish guano and meat guano, although obtained from animal carcases, have not been specifically dealt with in the preceding pages, because they are now definite manufactured manures and no longer waste substances.

2.—Residues from Manufactures.

Damaged Cakes.—Occasionally, damaged cakes, or meals or cakes unsuitable for feeding purposes, are offered to farmers as manure, and where it is possible to have them finely ground they are very useful substances. Rape meal really belong to this category, and in view of its uniformity may be taken as the standard in fixing a maximum price.

In Kent and Surrey (and no doubt elsewhere also) the price of a unit of ammonia derived from rape dust is about 20 per cent. higher than that of ammonia from fish guano, which in turn is somewhat higher than that from meat guano. There is no *à priori* reason for supposing that the actual value as manure differs to this extent, and it is very desirable that the matter should be settled by properly conducted trials.

Among the samples known to be used as manure were several Bombay cotton cakes yielding $4\frac{1}{2}$ to 6 per cent. of ammonia, and 0·2 to 4 per cent. of phosphate; also certain compound cakes, falling within the same limits of composition, which had in some way got mixed with excessive quantities of sand. The precise value of these cakes cannot be fixed; 8s. per unit might be offered in the first place for the ammonia and 1s. for the phosphate, and the price finally agreed on should be well below that of rape meal.

Shoddy.—Writing a century ago about woollen rags, Young says in his "Farmers' Calendar" article (March): "They hold moisture, and are adapted for dry, gravelly, and chalky soils, and succeed in dry seasons better than most manures, but they do little good on wet soils. London rags are found much better than those collected in the country; but the danger of catching the small-pox in chopping and sowing them deters many farmers from their use." Six to 10 cwt. per acre were ploughed in three months before sowing wheat and barley; one ton per acre was dug into hop gardens. The rags cost about £4 to £6 per ton on the farm.

To-day woollen rags usually go first to the manufacturer to be torn up, shredded, and again made into cloth, only the portions which cannot be utilised in this process being available as manure. Considerable admixtures of dirt, cotton, and occasionally oil, may be present, but the mechanical condition is, as a result of the shredding, excellent.

Shoddies may conveniently be divided into three classes:—

(1.) High grade, yielding 15 or 16 per cent. of ammonia, or, in the case of silk waste, 17 per cent.; the samples are clean and pure, and those sent to Wye College are often highly coloured. This class includes carpet waste and high quality cloth clippings. The supply is somewhat limited, manure manufacturers taking a considerable quantity; the price is therefore high, and varies between 7s. and 7s. 6d. per unit of ammonia.

(2.) Medium grade, yielding 6 to 9 per cent. of ammonia. The samples show considerable variation, and it is often difficult to get any guarantee about them; the class includes wool combings, wool waste, flock dust, and the poorer qualities of cloth clippings. The supply is larger and prices are lower than for the higher grade, but samples are not always sold on the basis of their composition, and during the past year variations of from 5s. to 7s. per unit of ammonia have occurred. Probably 6s. might be taken as an average quotation.

These shoddies are widely used in hop gardens, and with such good results that they deserve a wider trial. We have seen them occasionally used with good effect on other crops; they are not so slow acting as has sometimes been stated.

(3.) Low grade, yielding about 3 per cent. of ammonia. These are usually offered at from 4s. to 5s. per unit, and when this price includes delivery it cannot be considered high. The relative manurial values of lower and higher grade shoddies in an ordinary rotation are being tested on the College farm.

Refuse from Tanneries.—Leather dust, yielding about 4 per cent. of ammonia, is occasionally offered to farmers, but the recorded experiments show that it has little or no manurial value. Occasionally one hears of the beneficial use of leather scraps in horticulture, but the results may quite probably be due to other causes.

Other tannery wastes do not appear to be much used by farmers, although some of them doubtless have distinct manurial value.

3.—Residues from Towns.

Destructor Refuse.—From the samples of this substance sent in to the College, it cannot be supposed to have any greater value on the land than coal ashes of equal fineness.

Night-soil Poudrette.—For many years it has been a standing reproach to our inventive capacity that the enormous quantities of night-soil obtainable in England should be almost entirely wasted. On the Continent efforts have been made to convert it into merchantable manures, either by desiccation or by mixing with various substances, such as peat, ashes, slaughter-house residues, blood, or phosphates, the mixture being known as poudrette. In order to prepare this substance it is obviously necessary to employ the pan system, and as this is not in general favour in England, the application of the method here is limited. The pan system is still in vogue in many town districts, and in at least one place poudrette is manufactured. It is in very good condition, and yields about 8 per cent. of ammonia, 8 per cent. of phosphates, and nearly 3 per cent of potash; excellent results have followed the use of 3 to 6 cwt. per acre.

In the absence of definite experiments on the subject it is difficult to fix a fair value for poudrette, *à priori* considerations being very apt to lead to fallacies. It is commonly supposed that anything which has passed through the human or animal body must have a higher manurial value than before, but even if this be true for the whole of the excreta it certainly is not the case for the solid portion. The easily attackable parts of the food are taken up by the body and reappear to a great extent in the urine; the more resistant portions constitute the chief part of the solid excreta. Any method

for the agricultural utilisation of the fæces is defective if it fails to collect the urine, and the practical difficulties of doing this are probably insurmountable.

If the quantities of poudrette available ever became considerable it would be a matter of great interest to compare it as a fertiliser with meat guano and fish guano.

Similar fertilisers of much lower grade, yielding $2\frac{1}{2}$ per cent. of ammonia and 8 per cent. of phosphate, are occasionally offered in Kent, but their value being low the cost of handling becomes proportionately higher.

Sewage Sludges.—In most towns there is a sewage system, and the production of poudrette is impossible. Attempts have been made to utilise the sludge deposited from the sewage, but so far as the writer is aware they have resulted in failure. The sewage contains so much water that the soluble available matter is washed out to form a hopelessly dilute solution; only the insoluble portion is left in the sludge, and one could hardly expect it to make a useful manure.—*Journal of the Board of Agriculture, England.*

BEE NOTES.

SPRING MANAGEMENT.

By E. W. Alexander, in *Gleanings.*

This is one of the most important seasons of the year to the honey-producer, for if he neglects his bees at this time it is almost impossible for him to obtain any surplus from his early harvest. We should care for our bees so as to gain two or three weeks' time instead of losing any precious days. First, I wish to call your attention to the importance of keeping your bees as warm as possible all through the spring. If you can, try to have them set where they will have a natural windbreak of some kind. This is very essential to protect them from the cold north-west winds; and at all times of the year avoid shade. There may be some places where shade is necessary in the apiary, but I have never seen a colony do as well in the shade of a tree as those in the sun. During early spring I advise by all means contracting the entrance until it is quite small. We allow an entrance only $\frac{3}{8} \times 1$ inch, and sometimes still less; then when a warm day comes we enlarge it according to the needs of the colony; then toward night close it again if it is likely to turn cold. Also cover your hives with tarred building-paper. This is an excellent thing to retain the heat from the sun during the day, and in this way you can, with the natural heat of the colony, keep the whole hive so it will remain nice and comfortable all night.

Then if you will do as I advise in the above, so far as keeping them warm is concerned, they will gain fully three weeks' time over the way they are generally cared for.

Now we will take up the next most important part of spring management, that of stimulative feeding. This, with its twin brother, keeping them warm, is the magic word that unlocks the door to a successful summer. I care not how much old capped honey a colony may have, there is nothing that can be done to your bees during early spring that will pay like keeping them warm, night and day, and feeding a little warm syrup daily, made very thin from honey or granulated sugar, or both. If fed in the feeders I invented a few years ago a very little will answer the desired purpose. Two cents' worth per day, or about 50 cents' worth, if judiciously used, will be enough to carry the colony through the whole spring, and will, many times, be the means of giving you a large increase of colonies long before your harvest for surplus honey commences.

HOW TO GET BROOD FROM TWO QUEENS IN ONE HIVE.

Next the rearing of early queens is very important; also early drones. This is something we must not neglect. This part of our business has been made very easy and plain by such men as Pratt, and I will pass it for the present. But here is one thing I must describe to you all, and that is the proper and best way to care for our little weak colonies after taking them from their winter quarters. It is this: As soon as they have some uncapped brood in their hives, take them to a good strong colony; remove its cover and put a queen-excluder in its place, then set the weak one on top of the excluder and close up all entrances to the weak colony, except what they have through the excluder, down into the strong colony below. Leave them in this way together four or five weeks; then separate them, and you will have two good colonies, and will have saved yourself all worry about these weak colonies being robbed, chilled, or starved. When we are feeding the other colonies we usually give these a few spoonfuls of the warm syrup in a comb next their brood. This encourages them; and if there is not more than a cupful of bees they don't get much from the feeder under the strong colony. I have explained at bee conventions this way of saving these little colonies, and have received very complimentary letters afterwards from prominent bee-keepers, saying that this idea was worth more than 100 dollars to them.

This is something we have been practicing for more than twenty years. Some seasons we have a large number of weak colonies on top of strong ones during early spring, and we don't lose five per cent. of them. I am sure it goes a long way toward preventing spring dwindling. I will quote what my friend, J. A. Pearce, of Grand Rapids, Mich., says in the April *Review*, 1905, on this subject: "In regard to putting light swarms on top of heavy ones in the spring, I believe it is a great thing; in fact, I look upon it as one of the best things brought to light in modern bee-keeping. Last spring I had 16 swarms marked heavy, and just 16 marked light—in fact, so light that I almost despaired of getting them up to the honey harvest by any process; but when that article by Mr. Alexander came out in the April *Review*, telling us how to save weak colonies by setting them on top of strong ones, I concluded it would work, so I placed the whole 16 weak swarms on top of the 16 strong ones. I examined them some three weeks afterward, and such a change I never saw. Those weak swarms had built up so they were as strong as, if not stronger than the ones below, and had more honey because of the tendency to store above. I could scarcely believe that such results were possible. Then, again, instead of detracting in any way from the strong swarm below, it really seemed to be the reverse, as though they had

been stimulated by it to greater activity. Having the two queens depositing eggs instead of only one, the bees went out with a rush on all occasions when they could get out. It also proved another thing, which is that the upper queen is all right, only she was handicapped for want of bees and warmth; and as soon as these conditions were supplied she proved herself to be as prolific as her sister below, instead of being the worthless thing that she had been supposed to be."

I think I have shown you how we can keep our bees warm and comfortable through the sudden changes of early spring; also how we can stimulate them to early breeding by keeping them warm and feeding a little thin syrup every day. This is very important; and how you may save those little weak colonies and have them ready for your early harvest.

Delanson, N.Y.

[It should, perhaps, be stated at this time that Mr. Alexander will illustrate and describe his special form of feeder in a future article. For the present I will simply state that the device in question is a Simplicity trough feeder put under the bottom of the hive, and flush with the back end, the bottom board being shoved forward sufficiently to accommodate it.

I wish to draw attention particularly to Mr. Alexander's method of uniting a weak colony to a strong one, whereby both queens are preserved *and both do duty at once*. In the event that either queen is not quite up to the standard, the two will more than make up for the deficiency. That two queens *can* do duty at once in one colony after uniting, being separated by a perforated zinc, each in a separate brood-chamber, would have been deemed some years ago impracticable; but if it be true that the bees recognise their queens largely by colony odour, then the two queens in the hive at the same time, so long as they cannot get at each other, will be tolerated by the bees because they smell alike. Queen-breeders have been familiar with the fact that two queens can be maintained in one hive, separated from each other by perforated zinc. Occasionally, however, the queens will fight through one of the perforations, with the result that one will be stung to death by her opponent. In that case, possibly the bees will take a hand in the *fracas*. But these cases seem to be rare.

When I visited Mr. Alexander last summer he showed me a hundred or so colonies where he had two queens in at the same time. At the time, he had an upper entrance so that the bees in the upper story would not be compelled to go clear down through the upper set of combs. He explained how it was possible, in connection with his feeding, to get a large amount of brood through the agency of two queens, and yet none of that brood would suffer, as would be the case where the weak colony had to depend entirely on its own body heat on its own stand. Yes, here was the evidence or proof of the pudding, right before my eyes. It could not be gainsaid.

We should be glad to have our readers test this method of uniting, and report the results. The suggestion comes right in the nick of time for most northern localities.

Mr. Alexander does not say that the uniting takes place shortly after or at the time of taking the bees out of the cellar. If the bees of the weak colony had been out for two days, and had marked their location, many of them would be lost in returning to the old stand; but the fact that Mr. Alexander speaks of the uniting taking place as soon as they have uncapped

brood would indicate that the bees had had a flight or two, and that their weak condition had been discovered after they had been set out.

He will doubtless cover these points more fully in a subsequent article; but for the present, at least, I see no reason why a very weak colony could not be united to a strong one, putting perforated zinc between at the time of taking them out of the cellar. As we have tested this principle of dual queens only in a queen-rearing way in summer, there may be some practical reason why uniting bees just out of the cellar would not work.—ED. *Gleanings in Bee Culture.*]

MANURES FOR APPLES.

The following particulars relating to the use of artificial manures for apples are extracted from the *Gardeners' Chronicle*, and should prove of value to many of our orchardists:—

The experiments were carried out in Germany, with a large orchard of King of the Pippins apple, five long rows of which received different manurial treatment. One row was left untreated, while the four others had different manurial combinations. The row left unmanured yielded 104lb. of apples per tree during the five years reported on by Dr. Wagner, and in the fifth year (1904), which was the year of maximum yield for the entire orchard, the weight of the apples per tree was 55lb., and the number 294.

The best results from manuring were obtained by the use of a complete mixture, consisting of $1\frac{1}{8}$lb. of sulphate of ammonia, $1\frac{1}{2}$lb. of muriate of potash, and $3\frac{1}{2}$lb. of basic slag, applied to the roots during the winter. During the five years the yield per tree from this dressing was 163lb. of apples, while by the fifth year the crop had increased to 401 apples, weighing 105lb. per tree. That is, the wight of apples per tree was increased by this plan of manuring from 56lb. per tree on the unmanured trees to 105lb. per tree on the manured trees, or 90·0 per cent., while the number of apples per tree was increased from 294 to 401, or 36 per cent. The increase in the average size of the apples is perhaps as remarkable as any feature in these experiments. Those from the unmanured trees averaged 2·98oz. each, and those from the manured trees 4·19oz. each—an increase in the average size of apples of over 40 per cent.

The trees were planted in 1891, eight yards apart in every direction. Up to 1896 the soil between the trees was used for gooseberries, currants, and raspberries; in 1897 the land was fallowed; in 1898 and 1899 early

potatoes were grown; in 1900 a mixture of peas, beans, vetches, and oats were grown, and cut green; in 1901 early potatoes were again grown; while in the autumn of that year the orchard was sown to grass, in which it has remained ever since. The lessons of the manurial experiments are that apple and pear trees require as plant food the same fertilising ingredients, whatever the variety. They need nitrogen, phosphoric acid, and potash, and the quantities to be applied depend less on the variety than upon the nature of the soil and the age of the trees.

If the orchard is a large one, and closely planted, the most convenient method of manuring the trees is to apply the quantity of manure per acre. For fruit trees on a medium soil, in fair condition, about 3cwt. of nitrate of of soda (or 2½cwt. of sulphate of ammonia), 3cwt. of muriate of potash, and 7cwt. to 10cwt. of basic slag per acre per annum give the best results. For smaller orchards or gardens the quantities used per square yard per annum would be 1oz. of nitrate of soda (or 1oz. of sulphate of ammonia), 1oz. of muriate of potash, and 2½oz. of basic slag. If the soil is a heavy clay, the quantity of basic slag may be increased to 3oz. per square yard, and the quantity of muriate of potash reduced to three-quarters of an ounce. On lighter soils the muriate of potash might be increased to, say, 1¼oz. As to the application of the manures, the muriate of potash and basic slag are mixed together, but only just before using, and broadcasted in the autumn or early winter.

If there are crops grown under the trees which require tillage, then the application of the potash and slag may be made up to the end of winter. As soon as the sap begins to rise in the fruit trees, the nitrate of soda (or sulphate of ammonia) should be given as a top dressing. If it is intended to manure the trees singly, it must not be forgotten that the root system extends over a larger area than that covered by the branches. The area dressed should be not only that covered by the branches of the tree, but also two yards in addition all round. Although it is often recommended to dig a pit or hole round the tree, and to put the manure into this, so as to get it into immediate contact with the roots, a good many recent investigations show that it is not necessary. Some American experiments even show that it is injurious. All that is necessary is to broadcast the manure over the surface, and then either harrow it in or stir the soil lightly with a rake or spade.

It is worth noting that a report has come to hand from the United States Department of Agriculture on small fruit and orchard cultivation in that country, and in this is a strong recommendation to use artificial manures, and not farmyard or stable dung, for such orchards or fruit plantations. The reason given is that dung has been found to be a frequent carrier of noxious weed seeds, and that orchards and small fruit plantations are kept more free of these, and cost less for cleaning when artificials are used. The dressings recommended, and based on an enormous number of American experiments, are almost identical with those which Dr. Wagner has found so successful in Germany.

THE DAIRY HERD.

Its Management from Calf to Cow.

The future herd of a given farmer depends entirely upon his ability to raise good calves. We put it in this light because as a general rule it is impractical for him to buy good milk producers on the market. It is possible, of course, to pick up an extraordinary cow once in a great while, but the man who expects to build up a herd of superior merit must necessarily raise his own stock, says an exchange. For this reason the raising of calves becomes a most important part of the dairy business. Ordinarily the man who sells cream, or he who sells butter, cannot afford to feed whole milk to his calves for any length of time. He should, however, feed them whole milk for at least ten days. It is very necessary that the new-born should be fed colostrum, or the first milk, which nature has prepared in a special way for the calf. Colostrum is very rich in protein, containing from five to six times as much as normal milk. It also contains over twice as much ash as normal milk. Its sugar content is lower and its fat content is on the average about normal, although sometimes it is considerably higher. Koenig gives 3·6 per cent. as the average fat content of colostrum. Where milk is high priced, skim-milk may be substituted for whole milk after the calf is ten days old, but this substitution should be made gradually, say at the rate of about a pint at each feed.

After skim-milk has been substituted begin to feed flaxseed meal, either mixed with the milk in a raw state or else mixed with it after having previously been cooked into a gruel with water. We prefer the former method, for the reason, especially in the summer time, or even in the early spring, that there is danger of the gruel souring, it which case it is sure to produce scours, and, so far as we can see, there is no special advantage derived from cooking the flaxseed meal, as it does not become more digestible.

Another important factor that should not be overlooked is the feeding of roughage to the calves. They should be fed all the clover hay they can be induced to eat. We regard this as of great importance. A cow must have capacity for roughage, and the sooner the calf's paunch becomes accustomed to be distended the more rapidly it will develop. Keep the calf growing, but never allow it to become fat. This is where many make a mistake. They overdo the feeding and get the calf into the habit of laying on flesh, which is to the detriment of its future dairy qualities. The heifers should be bred so as to calve by the time they are from two years to 27 months of age. They ought not to be more than two years and five months old at first calving, because if allowed to run too long before they are bred they are prone to get in the habit of laying on flesh. This objection has already been referred to. Heifers should be forced to give as large a yield of milk during their first lactation period as possible. To this end they should be milked for at least ten months, regardless of the amount of milk they give.

When a heifer is not as fully developed as might be desired, it is a good plan not to breed her the second time until from four to five months after calving. This will afford her an opportunity for allowing her to go dry about three months before calving the second time, and still she may be milked for fully ten months. In the meantime she will gather strength and nearly reach her full development, which will place her in better condition for the good second year's work. Always keep in mind that the heifer is really to be trained for the dairy during the first two years' work, and upon this training will largely depend her future value as a dairy producer.

Many ask what is the best ration to feed a dairy cow in order to get the most economical results. It may be said that there is no "best ration." The farmer must largely be guided in his feeding operations by what he raises on the farm. The rule that should be observed, however, is to raise crops that he can produce most economically, and, if he has to purchase foods, the price of the different products as compared with their protein content should be his guide. A cow should be fed a balanced ration—that is, the ration should contain a certain amount of protein. Haecker, of Minnesota, has shown by a series of carefully conducted experiments that we know of, that two pounds of protein per day for a 1,000-pound cow at active work in the dairy is very close to the actual amount needed. A larger amount of protein means waste, while a smaller amount will not nourish the cow sufficiently to maintain her body in the best working condition.

Dairy cows should be well sheltered in winter. They must be kept comfortable. They should never be unduly excited. It is a poor plan to allow well-bred dairy cows to drink water at a temperature of 32 degrees Fahrenheit during the winter months. As a rule dairy cows do not receive water more than once per day; consequently when they go to the water-trough in the morning they will drink anywhere from 60 to 70 pounds, or from seven to eight gallons, all of which has to be heated to 102 degrees Fahrenheit, the normal body temperature of a cow. This necessarily means the combustion of a large amount of feed; besides, cold water gives a shock to the sensitive system that is not calculated to benefit milk-production.

WINE.

Before the Harrowgate Literary Club recently Mr. F. Perham, of Messrs. Hebblethwaite Brothers, Leeds, read an interesting and learned paper on "Wine," of which the following is an abstract:—

"Of all beverages now in common use, wine is the most ancient. It has been made and used in all periods of the world's history. Its origin is lost in the midst of antiquity. From the time of the deluge, the culture of the grape was continuous and general, especially in the land of Israel. In Egypt, Syria, and Greece, too, wine was made in considerable quantities.

"Vine culture spread gradually in a westerly direction, for it is found that at successive periods the Greeks, the Romans, the Spaniards, the French,

and, finally, the British, planted vineyards. In fact, in these latter countries, its cultivation accompanied the introduction of Christianity. In the early Roman period vines had been rooted up in Gaul; but in 276 A.D. the Emperor Probus gave permission for replanting, and included Great Britain in the license. The monks were the principal vine-growers.

"The cultivation of the vine in Britain began to decline in the fourteenth century, and for three principal reasons—(1.) The comparative unsuitability of the climate, (2) the cheapness of French wines, (3) the fact that English barons occupied a great portion of France, and were easily able to import wines to compete with the 'best British' of the period.

"The modern process of wine-making differs very slightly from that described in ancient records. As then, so now, in many European vineyards the grapes are trodden by barefooted men, and sometimes women, and the juice runs into tanks. Fermentation immediately sets in.

"All dictionaries define wine to be 'the fermented juice of the grape.' Every wine-grower knows that the newly-pressed juice is, or will be in an hour, in a state of fermentation. The latter converts the sweet juice into alcoholic wine. The celebrated M. Pasteur was the first to discover the element of fermentation to be a living germ, which exists in all vegetable matter. It is said that the fragrant flavour of the costly Havana cigar is derived from fermentation of the tobacco leaf. The germ exists in the grape before it is fully ripe. The bursting of the skin is the work of this germ, which eats up the saccharine of the fruit and converts it into alcohol. When the juice is stored into any vessel, the germ proceeds with its mission at a rapid rate, and multiplies rapidly. A natural wine is that result which is obtained by the fermentation of grape-juice to which nothing has been added before, during, or after fermentation. All such wines contain about 83 per cent. of water, however fine or costly they may be. For 6,000 years wine is what nature designed it to be—natural, fermented, alcoholic.

"French wines—clarets and Burgundies, red and white—are the most natural of all. In all these the natural alcohol generated suffices for the preservation of the wine and for its development. Owing to the even, cool temperature after each vintage, France will continue to produce the finest wines. A century ago French red wines were more popular than now.

"Another wine approximately natural is sherry. The fermentation and development are very erratic. Sometimes a little grape-spirit is necessary to prevent about twelve million gallons, as against about forty million gallons of spirits.

"As we attribute to a great extent to our 'two-bottle' grandfathers, through their excessive port-drinking and other evil habits, the gout which prevails to-day, so will our children and grandchildren attribute to this soda-water, tea-drinking age the neurotic disorders which we are at the present time generating so successfully and bequeathing to them.

"An Irishman was asked when was the best time to drink champagne. He instantly replied, 'Whenever I can get it,' and an old sage, when requested to say how much one should drink, wrote:—

"'The first glass for thirst,
The second for pleasure,
The third, if well nursed
By a fourth, is a treasure.
The fifth and sixth will lead you to heaven.
When thirsty with climbing you'll prize number seven.'"

GARDEN NOTES FOR JULY.

By PERCY G. WICKEN.

By July the ground has generally received the greater part of the season's rainfall, and, as a consequence, has become wet and cold, and plants make very little growth at this period of the year. Plants that were sown early in the season, and which have obtained a roothold of the ground, will do better than plants recently sown. If seeds of garden produce cannot be sown early in the season, it is best to leave them until August, when the worst of the winter will have passed. Plants sown in August will often make better growth and overtake those sown in July, as they have a better opportunity to go ahead without a check.

As the ground becomes wet, and possibly water-logged, it will again bring under the notice of the settler the question of drainage. While it may not be practical to drain the whole farm, a small area may be drained for garden purposes, and when this is done the results will be so encouraging that an effort will no doubt be made every year to extend the area. Agricultural drain-pipes can now be obtained very cheaply in Perth—about 40s. per thousand. To drain an area of land with pipes at 30 feet apart—a suitable distance for a light soil—requires only 1,450 pipes per acre; so that the cost would not be great. The pipes are made in foot lengths, and should be laid in the trenches closely touching one another, and a clump of grass or bushes laid over the joints. This prevents the earth from getting into the pipes and filling them up. If the drain is only a few chains in length, pipes two inches in diameter are sufficient; but the longer the length of drain, the greater is the diameter of the pipe required. Where pipes are not available blackboys, saplings, or stones can all be used for the purpose. Drains should not be less than two feet six inches from the surface, and, where the ground is level, must be given a slight fall to enable the drain to carry off the water. If underground drainage is out of the question, surface drains should be made through all the garden area, and the land between the drains ridged up; this will enable most of the surplus water to run off; but the underground system is much preferable.

ARTICHOKES (Globe) may be planted now or early in the spring. If the land is naturally rich it should be supplied with a liberal dressing of farmyard manure. The plant grows to a large size and produces quantities of flower buds, which are used as a vegetable before the buds open. Plant in rows three feet apart, and the same distance in the rows.

ARTICHOKES (Jerusalem) are grown for the tubers which form on the roots of the plants. They are planted by division of the roots, the same as potatoes. They are a hardy plant. Land should be prepared for planting next month.

ASPARAGUS.—Prepare land by trenching and digging in a quantity of well-rotted stable manure. In the warmer districts a few crowns may be put out; but planting is better delayed until August.

Beans (Broad) should now be bearing. In cooler localities a few more rows may be sown.

Beans (French).—In the northern areas a few rows may be sown; but frost will kill them.

Cabbage.—Put out as many plants as you are likely to require for your own use or for market. Only put out strong healthy plants. The seed in the seed-beds should not be sown too thick, otherwise weak, spindly plants are the result, and they never grow satisfactorily. Sow seed of Succession or St. John's Day to supply plants later on.

Carrot.—Sow a little seed to keep up a supply.

Cauliflower.—Plant out all young plants available A little more seed may be sown in cooler localities.

Cucumbers.—In the warmer portions a few plants may be raised under glass frames for planting out later on. Hills may be prepared in warm localities for planting out next month.

Leeks.—Plant out any seedlings on hand, and sow a small quantity of seed for further use.

Lettuce.—Plant out all seedlings available, and sow a further supply of seed. The land should be well manured, as the plants require to be quickly grown or they become bitter.

Onions.—When the plants in the seed-beds are sufficiently grown they should be planted out in well-worked and well-manured soil. Plant in drills 12 to 15 apart, and 6 inches apart in the drills; keep the soil between the drills well hoed. Sow a little seed for future use.

Peas.—A full supply of peas may be sown this month: there is always a good demand for them. Plant in rows 3 feet apart. Manure well with superphosphate and sulphate of potash. Supplies of the nitrogenous bacteria can now be obtained in Perth for this and other leguminous plants.

Potatoes.—In localities where there is no frost potatoes can be planted for an early crop. If too risky to sow, land can be prepared for future sowing.

Tomatoes.—Plants in warmer localities can be raised under glass or in boxes. Plant only the best smooth-skinned varieties: they are the most profitable.

Turnips.—Thin out those already up, and hoe the weeds. Plant out a few more rows for later use. Swedes will probably do better than white turnips, if sown now.

Farm.—It was very late in the season before sufficient rain fell to be of service in the farming districts, consequently farmers were unable to get their ploughing done until late, and seeding operations extended much later in the year than is usual.

All cereal crops should be sown by the end of June at the latest. The advantages of fallowing have been demonstrated this season in a striking manner. Those who had areas of fallow land were enabled to get their crops sown early in the season, and in most cases got all their fallow sown and were waiting for the rain, to plough further areas, before those who had to wait for rain to enable them to plough could make a start.

After the paddocks have been sown and harrowed down, a few plough furrows run along from any spots where water is known to accumulate will prove of benefit; as, if the water can be run off these places, the crop will be much improved. During the wet weather in the winter the opportunity should be taken to get all the harness on the farm repaired and put in good order; also to overhaul the tools and implements and put them in good repair, so that they are ready to use at a minute's notice at a busier time.

Stocktaking is an operation carried out on very few farms. A list should be made out annually of everything of value on the farm. Useless articles should be written off, and a valuation made of all the plant and stock on the place. By this means it can be ascertained to what extent the farm has prospered during the past year; and also, by comparing this valuation with the books showing the receipts and expenditure, a correct balance-sheet can be obtained as to the profit and loss for the year. July is the most suitable month for this work, as, first of all, it is one of the slackest months for farm work, and, secondly, all the crops grown during the year are harvested, and probably sold; lambing has taken place, and the crop for the coming season has been planted, and a very correct estimate of value can be made.

Any well-drained land not already sown should be worked up and prepared for sowing early spring crops next month.

Some farmers prefer to sow lucerne and rape in the spring. Where this is done the land should be got in readiness so that the seed can be sown the first week in August.

LOCAL MARKETS' REPORTS.

Messrs. H. J. WIGMORE & Co.'s REPORT.

H. J. Wigmore & Co., of Fremantle, Perth, Kalgoorlie, and Northam, report as follows in connection with their daily auction sales of chaff and grain at Perth Railway Yards for month ending Friday, 8th inst:—

Chaff.—During the month arrivals of chaff at Perth Railway Yards have been very small, an average of little more than 50 trucks per week being maintained. Exceptionally high prices, however (as under ordinary circumstances with similar arrivals could reasonably be expected), have not eventuated, and this position has been brought about solely by the importation of South Australian chaff. Heavy purchases f.o.b. Port Adelaide have been made, and these have more than filled up the shortage in the local article. In addition to the fact that most of the larger Perth and Fremantle produce merchants have their stores full of S.A. chaff, considerable quantities have been offered at the daily auction sales in Perth yards. In one week alone 35 trucks of imported chaff were submitted, most of which were bogies, the quantity represented therein approximating 180 tons. This state of affairs of course only has one effect, viz., to prevent local chaff realising more than the price at which the imported article is sold. It is true values have improved in South Australia, present prices being £3 2s. 6d. to £3 5s. f.o.b., the equivalent of this being £5 on rails, Fremantle, or £5 2s. 10d. on rails, Perth. It must be remembered, how-

ever, that many importers purchased at much lower figures than these, and are quite prepared to take their profit and sell at lower equivalents. We are pleased to report, however, that during the last few days a slight firmness has manifested itself, owing to the market being practically bare of local supplies, and the fact that imported has also not been so much in evidence. This may be only temporary, but we anticipate that the future of the market will be towards regular prices, and we certainly do not look for very high prices this season, for reasons frequently explained through the medium of our daily and weekly reports. We quote to-day's closing values as follows:—Prime green wheaten, £5, with possibly an occasional extra 2s. 6d., f.a.q.; wheaten, £4 15s. to £4 17s. 6d.; good medium wheaten, £4 10s. to £4 12s. 6d.; medium wheaten and cow chaff, £4 upwards, according to condition. Prime oaten is very scarce indeed, and a truck or two would probably realise £5 2s. 6d., and possibly £5 5s. With regard to imported chaff, we wish to make a statement that, owing to our very extensive connection with the farmers of W.A., we have absolutely declined to sell f.o.b., or be connected in any way with the introduction of South Australian chaff to the West, as we have claimed all along that there is, up to time of writing, no evidence forthcoming to prove that there is insufficient chaff in this State for our requirements.

Wheat.—We have no alteration to report in the Eastern wheat market, which has continued to rule firm at 3s. 4d. to 3s. 4½d. f.o.b. Melbourne or Adelaide for f.a.q. shipping parcels. These prices are at least 1s. per quarter above present London equivalent, taken on a basis of ordinary sailer freights ruling. We hear, however, that parcels have been shipped by steamer from Melbourne at 15s. per ton freight, which is extraordinarily low, and it is only with such low freights that business is at all possible with United Kingdom and Continent. Local wheat has also been extremely regular in its value. Highest price secured at auction during the month is 3s. 8½d. We declined to accept this figure for a truck of prime milling to our care this morning, and secured 3s. 9d. privately. We quote the latter figure as highest market value obtainable, weevilly and pinched samples lower according to condition.

Oats.—This commodity has made a considerable rise in Victoria, Tasmania, and New Zealand. We quote the following prices:—Good Feed Algerians, f.o.b. Melbourne 2s. 8d., on spot 3s. 1d. whole, 3s. 2d. crushed; New Zealand stouts nominally 2s. 6d. f.o.b., on spot 3s. 6d. whole, and 3s. 7d. crushed; Tasmanian stouts 2s. 10½d. f.o.b., on spot 3s. 5d. to 3s. 6d. We think, however, that oats have now seen their highest prices, and indeed, as we write, we have a quote in from Melbourne 2s. 7½d. for Good Feed Algerians. We should not be surprised to see them ease still further in Melbourne, largely on account of the recent rains, and again the fall in the offal market. Tasmanians are also on the down grade, 3s. having been asked in some quarters a few days back.

Flour.—Since we last reported to this *Journal*, we have to advise a further advance in the price of Thomas' Adelaide "Standard," which is now £7 12s. 6d. sacks, £7 17s. 6d. quarters, f.o.b. Port Adelaide. On rails Northam, we continue to quote £8 sacks, £8 5s. quarters, and have to report very heavy sales, especially of the Northam "Standard." Indeed, this flour, on account of its splendid baking qualities, is gradually superseding the imported.

Bran and Pollard.—These commodities went up to very high prices in the Eastern States during the month, but we now have to report that they are distinctly easier owing to the heavy rains. Sydney is now down to 10d., f.o.b., for both bran and pollard, and Melbourne has eased to 10½d. for bran, Adelaide 11d. We have made considerable sales, but look forward to slightly lower prices.

Bran Bags have made a considerable rise, and market is very firm at 5s. 2d. to 5s. 3d.

Kalgoorlie Chaff Report.

Our Kalgoorlie office reports that they have made heavy sales of prime green wheaten during the month at £6 to £6 2s. 6d., and medium qualities at £5 10s. upwards. The market, however, is now being plentifully supplied, and is somewhat easier. We quote present value for prime green wheaten £5 17s. 6d. to £6, with perhaps an occasional splash sale at £6 2s. 6d.; f.a.q. wheaten, £5 15s. to £5 17s. 6d. We cannot advise consignments of lower qualities to Kalgoorlie, which are always very difficult to quit in that centre.

W.A. GENERAL PRODUCE COMPANY'S REPORT.

Market report of the W.A. General Produce Company, 245 Murray-street, Perth, for the week ending Wednesday, 13th June, 1906:—

Business during the past week fairly good; supplies very irregular owing to the busy time with farmers sowing their crops, and, in consequence, a great deal of imported produce has to supply the demand. Detailed particulars as follows:—Bacon: Good supplies on spot; sales very good; values inclined to ease. Hams: Well-known brands sell well at quotations. Butter: Stocks on spot rather short; values on the rise, and likely to advance materially very shortly. Cheese: New mild lots find moderate outlet. Eggs (local); Supplies on the increase; values gradually weakening. Poultry farmers should not hold stocks, but send to market often. Potatoes: Imported lots supplying nine-tenths of requirements; values continue. Onions: Fair supplies of Victorians; values steadily advancing. Chaff: Large quantities of imported continue to arrive; values have been materially changed in consequence, hence local holders of West Australian grown will not fare as well as was predicted by some commission agents early in the season. Vegetables: Very plentiful; values ruling in some instances much below cost of growing. Poultry: Table birds in fairly good demand, likewise fat ducks; mixed lots of hens and aged roosters not much in favour. Turkeys: Fairly plentiful. Carcase pork: Medium size sells well.

Farm and Dairy Produce.—Bacon: Hutton's, 9d.; Newnham's, 8d. to 8½lb. Hams: Hutton's, 1s. 1d.; others, from 6d. per lb. Butter: Euroa, 1s. 1½d.; Hansen, 1s. 0¾d; Millewa, 1s. 1d. per lb. Lard, in bladders, 7½d. Cheese: Medium, 7½d.; loaf, 8d. Eggs: New laid, 1s. 9d. to 2s. per doz.; country, 1s. 7d. to 1s. 10d. per doz. Potatoes: Local, new garden lots, 12s. to 15s. per cwt.; imported, 10s. to 11s. per cwt.; seed lots, 12s. to 14s. per cwt. Onions, 9s. 6d. to 10s. per cwt. Chaff: Prime sample, £4 18s. 6d. to £5 5s. per ton.; others, from £4 5s. to £4 17s. 6d. per ton. Bran and Pollard, from £6 5s. to £6 10s. per ton. Flour: Northam and York, £8 15s. to £9 per ton; Guildford and Katanning, £8 10s. to £8 15s. per ton. Oats: White, 3s. 9d. per bushel; Algerian, 3s. 4d. to 3s. 6d. per bushel. Wheat: Truck lots, 3s. 9½d. to 3s. 10d. per bushel. Oil-cake: £9 10s. per ton.

Fruit.—Oranges: Navel, 7s. to 12s.; ordinary, 5s. to 8s. 6d. per case. Lemons: 5s. 6d. to 7s. 6d. per case. Mandarines: 9s. to 16s. per case. Persimmons: 7s. 6d. to 12s. 6d. per case. Bananas: 25s. to 30s. per crate. Passion Fruit: 6s. to 8s. 6d. per case. Pomeloes: 3s. 6d. to 4s. 6d. per case. Cape Gooseberries: 2d. to 3½d. per lb. Apples: Dessert, from 7s. 6d. to 12s. per case, prime quality; dessert, from 6s. to 7s. per case, medium quality; cooking and mixed lots, from 4s. 6d. to 5s. 6d. per case. Pears: Dessert, 9s. to 14s. per case, prime quality; dessert, 6s. 6d. to 8s. per case, medium quality; cooking, 4s. 6d. to 5s. per case.

Vegetables.—Cabbage, from 1s. to 4s. 6d. per cwt., according to quality. Cauliflowers, from 1s. to 9s. 6d. per doz., according to size. Carrots, from 9d. to 1s. 6d. per doz. bunches. Parsnips, 1s. to 1s. 9d. per doz. bunches. Turnips, white, 9d. to 1s. 6d. per doz. bunches. Swedes, from 1s. to 1s. 6d. per doz. bunches. Swedes, bulk, 2s. to 2s. 9d. per cwt. Beans, French, 2d. to 3d. per lb. Marrows, 2s. to 3s. per dozen. Pumpkins: Ironbark, 3s. to 5s. 6d. per cwt.; bugles, 2s. to 3s. 6d. per cwt. Rhubarb, 1d. to 2d. per lb. Leeks, 4d. to 1s. per dozen bunches. Sweet potatoes, 1d. to 2d. per lb.

Salads and Herbs.—Lettuce, from 1s. to 3s. per quarter bag. Spring onions, 3d. to 4d. per bundle. Beetroot, 7d. to 1s. 6d. per dozen bunches. Tomatoes, 2s. to 6s. per case. Celery, from 6d. to 2s. 6d. per dozen heads. Raddishes, 2d. to 4d. per dozen bunches. Thyme, marjoram, and sage, 2s. to 2s. 6d. per tray. Mint, 2d. to 3d. per bundle. Parsley, 2d. to 3d. per bundle.

Poultry (for killing).—Fowls: Prime table birds, 5s. to 6s. 6d. per pair; mixed lots, from 3s. 6d. to 4s. 6d. per pair. Chickens, from 1s. 9d. to 2s. 6d. per pair. Ducks, from 4s. 6d. to 6s. 6d. per pair. Geese, worth 7s. to 8s. 6d. per pair. Turkeys: Gobblers, from 9s. 6d. to 15s. per pair: hens, from 6s. 6d. to 10s. per pair.

Carcase Meat.—Pork, medium size, 4d. to 5d. per lb.

Sundries.—Corn sacks, secondhand, 4s. 6d. per dozen. Bran bags, secondhand, 3s. 6d. per dozen. Bone-dust, £7 10s. per ton. Phosphate, £5 10s. per ton. Guano: Ammoniacal, £5 10s. per ton; phosphate, £4 10s. per ton. Ammonia, 20s. per cwt. Nitrate of potash, 17s. per cwt.

THE CLIMATE OF WESTERN AUSTRALIA DURING MAY, 1906.

Winter conditions set in on the 3rd of the month, when an ordinary winter "low" passed along the South coast from West to East, and fairly heavy rains fell in South-West districts. Since then there has been the usual succession of fine and stormy weather. The only two disturbances which are worthy of special notice are, first, one which passed Albany on the 16th, and at 8 a.m. on the 17th had reached the longitude of Eucla; yet on the afternoon and evening of that day steady rain fell on the Coolgardie Goldfields, as much as an inch being recorded at several places; and, secondly, a disturbance which approached the West coast from the Indian Ocean on the 25th, and appears to have passed across the South-West corner of Australia, between Perth and Cape Leeuwin. This does not very frequently happen, for, as a general rule, the "lows" pass to the South of Cape Leeuwin in the winter time, but whenever it does, as in the present case, heavy rain falls in South-West coastal districts. In this instance severe thunderstorms were experienced, and the maximum rain recorded for the 24 hours ending 8 a.m., on the 26th, was 280 points at Karridale.

The "low" afterwards traversed the Southern Ocean, as usual.

On the whole, the rainfall was slightly above normal in the Southern portions of the State, from about the latitude of Perth to the South coast. Elsewhere it was light and considerably below the average for previous years; and in the tropics most stations reported *nil*.

Pressure was slightly below normal throughout the State.

The temperature was about an average, or perhaps slightly above, in coastal districts from Sharks Bay to Albany, but throughout the rest of the State it was unusually high, the excess of the mean maximum above that for previous years being 4 degrees to 7 degrees on the Coolgardie Fields, and as much as 9 degrees at Peak Hill. This excessive heat seems to have prevailed throughout the greater portion of Australia, for we find that at Adelaide the mean maximum was 2·8 degrees, and at Sydney 2·2 degrees, above the average for previous years.

No severe frosts have yet been experienced, but the temperature of the surface of the ground has, on occasions, fallen below 32 degrees. The following table shows the mean and absolute readings of a minimum thermometer, placed on the surface of the ground, at a few places:—

Station.	Mean.	Lowest.	Date.
Peak Hill	50·0	34·0	11
Cue	50·4	38·0	11, 12
Coolgardie	44·3	33·2	11
Southern Cross	42·5	31·0	11
Walebing	40·6	29·5	29
York	43·6	35·0	29
Perth Observatory ...	50·1	40·0	19
Bridgetown	39·4	26·9	20
Karridale	—	32·0	20
Katanning	40·0	29·0	19
Mount Barker	43·7	32·8	19

W. E. COOKE,
Government Astronomer.
per E. A. W.

The Climate of Western Australia during May, 1906.

	Locality.	Barometer (corrected and reduced to sea-level).				Shade Temperatures.									Rainfall.		
						May, 1906.					* Average for previous Years.						
		Mean of 9 a.m. and 3 p.m.	Average for previous years.	Highest for Month.	Lowest for Month.	Mean Max.	Mean Min.	Mean of Month.	Highest Max.	Lowest Min.	Mean Max.	Mean Min.	Highest ever recorded.	Lowest ever recorded.	Points (100 to inch) in Month.	Wet Days.	Total Points since Jan. 1.
North-West and North Coast:	Wyndham	29·964	29·976	30·117	29·802	93·3	74·4	83·8	96·1	67·2	90·4	71·7	100·4	58·0	*Nil*	...	1,383
	Derby	29·968	29·983	30·119	29·802	94·1	66·7	80·4	98·6	59·2	89·6	64·0	98·8	46·0	*Nil*	...	1,017
	Broome	29·966	29·989	30·124	29·768	92·4	68·0	80·2	98·2	58·6	87·7	63·3	97·3	46·4	*Nil*	...	961
	Condon	29·990	30·026	30·187	29·846	86·0	58·8	72·4	93·8	56·5	82·3	57·9	98·0	42·0	*Nil*	...	220
	Cossack	29·000	30·030	30·209	29·872	88·2	62·4	75·3	93·0	57·8	83·3	62·9	93·9	48·8	*Nil*	...	105
	Onslow	29·017	30·028	30·254	29·870	87·5	59·0	73·2	98·0	47·8	83·3	59·8	95·0	42·0	1	1	92
	Winning Pool ...	29·015	...	30·279	29·856	88·3	57·7	73·0	96·8	49·0	...	...	...	...	14	1	87
	Carnarvon	29·038	30·070	30·330	29·865	78·7	59·0	68·8	96·0	49·0	78·3	57·6	91·3	42·8	7	2	37
	Hamelin Pool... ...	29·050	30·068	30·359	29·836	78·2	55·0	66·6	89·4	45·0	76·5	55·6	89·8	42·0	37	4	39
	Geraldton	29·102	30·102	30·391	29·783	74·1	56·0	65·0	86·0	49·0	73·8	55·6	89·0	39·3	247	7	311
Inland:	Hall's Creek	29·006	30·066	30·189	29·863	89·3	56·8	73·0	97·0	48·4	83·5	55·7	98·0	38·9	*Nil*	...	395
	Marble Bar	...	...	...	...	91·1	60·2	75·6	96·9	55·0	87·5	61·4	97·0	44·0	*Nil*	...	484
	Nullagine	29·030	29·990	30·289	29·800	88·2	52·2	70·2	93·0	46·5	81·9	53·8	94·0	38·0	*Nil*	...	497
	Peak Hill	29·050	29·090	30·330	29·750	82·0	56·0	69·0	91·0	42 0	73·1	53·0	89·0	38·8	2	1	24
	Wiluna	29·056	29·072	30·360	29·692	79·1	50·1	64·6	90·2	38·0	73·5	50·2	91·0	31·9	5	1	271
	Cue	29·088	29·116	30·412	29·738	77·7	53·8	65·8	88·2	42·2	73·9	51·5	93·3	35·9	20	2	144
	Murgoo	...	...	...	...	78·7	52·8	65·8	90·0	42·0	...	...	...	...	23	2	41
	Yalgoo	29·065	29·109	30·406	29·731	75·4	51·7	63·6	89·5	40·0	72·5	49·9	94·0	35·7	187	5	246
	Lawlers	29·073	29·132	30·376	29·662	77·8	51·5	64·6	88·8	36·8	70·4	49·9	89·9	33·1	10	3	348
	Laverton	29·106	29·137	30·415	29·689	76·9	53·1	65·0	89·8	35·0	71·2	49·7	91·9	30·7	*Nil*	...	339
	Menzies	29·100	29·152	30·410	29·673	74·3	47·6	61·0	86·2	34·8	68 6	48·6	89·0	32·1	51	3	347
	Kanowna	...	...	...	...	72·7	48·4	60·5	86·2	36·0	...	...	...	...	145	5	306
	Kalgoorlie	29·116	29·156	30·431	29·651	72·6	50·1	61·4	85·9	39·2	67·8	48·7	88·1	34·5	130	4	218
	Coolgardie	29·118	29·154	30·434	29·635	71·4	48·3	59·8	84·4	38·1	67·7	47·7	88·4	34·1	149	4	283
	Southern Cross ...	29·115	29·131	30·427	29·661	71·8	46·9	59·4	85·6	35·4	68·6	45·7	90·0	30·0	225	7	331
	Kellerberrin	...	...	...	...	...	...	...	...	...	...	...	...	...	106	11	180
	Walebing	...	...	...	...	69·9	47·6	58·8	90·0	37·0	67·6	47·4	84·7	31·4	240	11	441
	Northam	...	...	...	...	70·0	47·9	59·0	89·0	38·4	68·2	47·3	85·0	34·3	226	13	270
	York	29·118	29·136	30·406	29·704	70·2	48·1	59·2	86·7	36·0	68·8	45·9	85·0	32·0	180	12	221
	Guildford	...	...	...	...	71·3	51·6	61·4	88·0	41·0	69·4	50·6	85·0	33·5	586	14	734

The Climate of Western Australia during May, 1906—*continued.*

Locality.	Barometer (corrected and reduced to sea-level). Mean of 9 a.m. and 3 p.m.	Average for previous years.	Highest for Month.	Lowest for Month.	Shade Temperatures. May, 1906. Mean Max.	Mean Min.	Mean of Month.	Highest Max.	Lowest Min.	Average for previous Years. Mean Max.	Mean Min.	Highest ever recorded.	Lowest ever recorded.	Rainfall. Points (100 to inch) in Month.	Wet Days.	Total Points since Jan. 1.
South-West and South Coast:																
Perth Gardens	29·094	29·122	30·389	29·693	68·2	53·9	61·0	80·0	46·4	69·6	50·7	92·0	35·0	711	17	943
Perth Observatory ...	29·102	29·124	30·409	29·681	69·5	53·7	61·6	84·0	45·6	68·5	52·4	82·4	39·9	675	18	888
Fremantle	29·118	29·112	30·418	29·741	68·8	56·5	62·6	78·8	48·5	68·4	55·0	80·4	43·0	466	15	563
Rottnest	29·110	29·101	30·392	29·688	68·4	59·6	64·0	80·0	50·0	67·6	57·2	78·0	45·0	570	16	640
Mandurah	...	...	...	...	69·5	51·7	60·6	79·7	41·0	68·3	50·1	80·7	36·5	719	13	919
Marradong	...	...	...	...	...	...	...	...	...	...	...	...	...	344	11	450
Wandering *	...	...	...	...	65·3	37·4	51·4	86·3	35·0	66·3	43·0	76·9	31·1	278	8	389
Narrogin	...	...	...	...	...	...	...	...	...	...	...	...	...	176	11	...
Collie	...	...	...	...	66·8	43·3	55·0	81·5	33·0	65·1	41·7	77·4	29·0	353	15	668
Donnybrook	...	...	...	...	68·2	46·8	57·5	82·9	36·3	66·6	46·4	78·1	33·0	328	12	719
Bunbury	29·085	29·120	30·380	29·660	69·1	52·2	60·6	80·0	43·0	68·1	50·7	82·0	36·0	371	12	612
Busselton	...	...	...	...	67·4	49·3	63·4	77·2	39·8	66·5	48·9	77·7	35·0	571	15	758
Cape Naturaliste ...	29·068	...	30·369	29·643	67·4	55·6	61·5	73·2	46·0	...	...	...	...	625	15	905
Bridgetown	...	...	...	...	67·3	44·3	55·8	81·2	33·0	65·7	42·3	77·7	27·6	463	17	738
Karridale	29·050	29·100	30·350	29·500	70·0	52·0	61·0	78·0	39·0	67·3	48·8	81·1	32·5	544	19	1021
Cape Leeuwin	29·035	29·065	30·360	29·570	66·0	58·0	62·0	74·0	50·0	65·9	56·2	78·8	44·9	543	22	1017
Katanning	29·090	29·124	30·429	29·648	67·3	47·6	57·4	84·0	36·0	64·6	44·7	79·0	30·5	205	10	437
Mt. Barker	...	...	...	...	63·2	48·5	55·8	74·0	38·8	...	...	...	...	325	18	705
Albany	29·055	29·104	30·424	29·561	65·0	51·8	58·4	74·0	38·8	65·4	48·8	80·0	35·1	579	22	1053
Breaksea...	29·036	29·096	30·420	29·555	63·9	55·2	59·6	75·0	51·2	63·9	53·9	78·2	42·1	372	22	789
Esperance	29·092	29·147	30·464	29·560	70·0	52·7	61·4	89·0	43·8	67·9	49·8	86·0	35·0	427	13	622
Balladonia	29·128	29·140	30·464	29·606	71·1	46·2	58·6	87·8	37·8	67·9	47·1	88·2	34·6	144	5	257
Eyre	29·090	29·164	30·425	29·756	74·0	49·4	61·7	93·6	36·5	68·8	53·4	92·1	34·0	134	7	401
INTERSTATE.																
Perth	30·102	29·124	30·409	29·681	69·5	53·7	61·6	84·0	45·6	68·5	52·4	82·4	39·9	675	18	888
Adelaide	30·156	29·149	30·440	29·740	68·0	52·0	60·0	82·0	46·0	65·2	50·0	88·3	36·9	212	12	536
Melbourne	...	29·023	...	...	...	...	...	...	...	61·4	46·5	82·1	31·3	...	...	...
Sydney	30·210	29·091	30·500	29·880	67·0	54·0	60·5	80·0	48·0	64·8	52·0	83·8	40·2	732	...	1506

* Average for three years only.

The Observatory, Perth, May, 1906.

W. E. COOKE, Government Astronomer.

RAINFALL for April, 1906 (completed as far as possible), and for May, 1906 (principally from Telegraphic Reports).

Stations.	April. No. of points. 100 = 1in.	April. No. of wet days.	May. No. of points. 100 = 1in.	May. No. of wet days.
East Kimberley:				
Wyndham ...	16	1	Nil	...
6-Mile	Nil	...	...	...
Carlton	39	3	...	...
The Stud Station	...	...	...	...
Argyle Downs ...	Nil	...	...	...
Rosewood Downs	...	...	...	...
Lisadell	...	...	...	...
Turkey Creek ...	Nil	...	Nil	...
Ord River ...	...	...	...	...
Alice Downs ...	...	...	...	...
Flora Valley ...	5	1	...	...
Hall's Creek ...	Nil	...	Nil	...
Nicholson Plains	...	...	...	...
Ruby Plains ...	...	...	...	...
Denison Downs	...	...	...	...
West Kimberley:				
Mt. Barnett ...	...	...	...	...
Corvendine ...	...	...	...	...
Leopold Downs...	...	...	...	...
Fitzroy Crossing (P.O.)	3	1	Nil	...
Fitzroy Station ...	...	...	...	...
Quanbun ...	Nil	...	...	...
Nookanbah ...	...	...	...	...
Upper Liveringa	Nil	...	...	...
Mt. Anderson ...	...	...	...	...
Yeeda	163	1	...	...
Derby	14	1	Nil	...
Pt. Torment ...	131	2	...	...
Obagama ...	211	6	...	...
Beagle Bay ...	142	6	...	...
Roebuck Downs	59	1	...	...
Kimberley Downs	...	...	...	...
Broome	16	2	Nil	...
Thangoo ...	...	...	...	...
La Grange Bay...	2	1	Nil	...
N.W. Coast:				
Wallal	82	1	Nil	...
Pardoo	...	...	...	...
Condon	Nil	...	Nil	...
DeGrey River ...	...	...	...	...
Port Hedland ...	Nil	...	113	1
Boodarie ...	...	...	...	...
N.W. Coast—*cont.*				
Balla Balla ...	...	...	...	...
Whim Creek ...	Nil	...	...	...
Mallina	...	...	...	...
Croydon	168	2	...	...
Sherlock ...	...	...	...	...
Woodbrooke ...	...	...	...	...
Cooyapooya ...	Nil	...	...	...
Roebourne ...	Nil	...	Nil	...
Cossack	Nil	...	Nil	...
Fortescue ...	Nil	...	Nil	...
Mardie	...	...	...	...
Chinginarra ...	...	...	...	...
Yarraloola ...	3	1	...	...
Peedamullah ...	Nil	...	...	...
Onslow	Nil	...	1	1
Point Cloates ...	...	...	...	...
N.W. Inland:				
Warrawagine ...	196	2	...	...
Eel Creek ...	...	...	...	...
Muccan	...	...	...	...
Ettrick	...	...	...	...
Mulgie	Nil	...	...	...
Warralong ...	Nil	...	...	...
Coongon ...	...	...	...	...
Talga	...	...	...	...
Bamboo Creek ...	90	1	Nil	...
Moolyella ...	...	...	...	...
Marble Bar ...	31	2	Nil	...
Warrawoona ...	Nil	...	Nil	...
Corunna Downs	Nil	...	...	...
Mt. Edgar ...	...	...	...	...
Nullagine ...	20	1	Nil	...
Middle Creek ...	...	...	...	...
Mosquito Creek	...	...	...	...
Roy Hill ...	...	...	...	...
Bamboo Springs	Nil	...	...	...
Kerdiadary ...	...	...	...	...
Woodstock ...	Nil	...	...	...
Yandyarra ...	...	...	...	...
Station Peak ...	Nil	...	...	...
Mulga Downs ...	...	...	...	...
Mt. Florence ...	...	...	...	...
Tambrey ...	10	1	...	...
Millstream ...	Nil	...	...	...
Red Hill ...	Nil	...	...	...

RAINFALL—*continued.*

Stations.	April. No. of points. 100 = 1in.	April. No. of wet days.	May. No. of points. 100 = 1in.	May. No. of wet days.
N.W. Inland—*cont.*				
Mt. Stewart ...	...	...	...	...
Peake Station ...	Nil	...	...	...
Nanutarra ...	...	...	...	...
Yanrey	...	...	...	...
Wogoola ...	...	...	...	...
Towera	30	1	...	...
Gascoyne:				
Winning Pool ...	Nil	...	14	1
Coordalia ...	...	...	...	...
Wandagee ...	...	...	...	...
Williambury ...	Nil	...	...	...
Yanyeareddy ...	...	...	...	...
Maroonah ...	...	...	...	...
Ullawarra ...	Nil	...	...	...
Mt. Mortimer ...	...	...	...	...
Edmunds ...	...	...	...	...
Minnie Creek ...	...	...	...	...
Gifford Creek ...	Nil	...	...	...
Bangemall ...	...	...	...	...
Mt. Augustus ...	...	...	...	...
Upper Clifton Downs	Nil	...	...	...
Clifton Downs ...	...	...	...	...
Dairy Creek ...	Nil	...	...	...
Mearerbundie ...	42	1	...	...
Byro	Nil	...	...	...
Meedo	...	...	...	...
Mungarra ...	Nil	...	...	...
Bintholya ...	...	...	...	...
Lyons River ...	Nil	...	...	...
Booloogooroo ...	...	...	...	...
Doorawarrah ...	Nil	...	...	...
Brick House ...	Nil	...	...	...
Boolathana ...	...	...	...	...
Carnarvon ...	Nil	...	7	2
Dirk Hartog ...	Nil	...	...	...
Shark Bay ...	Nil	...	52	2
Wooramel ...	Nil	...	43	2
Hamelin Pool ...	2	1	37	4
Kararang ...	Nil	...	...	...
Tamala	Nil	...	...	...
Yalgoo District:				
Woolgorong ...	3	1	...	...
New Forest ...	Nil	...	...	...
Yuin	Nil	...	...	...
Pindathuna ...	Nil	...	...	...
Yalgoo District—*contd.*				
Tallyrang ...	Nil	...	...	...
Mullewa ...	4	1	219	7
Kockatea ...	4	1	...	...
Barnong ...	15	1	...	...
Gullewa	Nil	...	...	...
Gullewa House...	13	1	...	...
Gabyon	5	1	...	...
Mellenbye ...	Nil	...	...	...
Wearagaminda...	8	1	..	...
Yalgoo	10	2	187	5
Wagga Wagga ...	Nil	...	...	...
Muralgarra ...	12	1	...	...
Burnerbinmah ...	2	1	125	6
Nalbara	2	1	76	7
Wydgee	Nil	...	89	4
Field's Find ...	Nil	...	128	5
Rothesay ...	...	...	...	...
Ninghan ...	Nil	...	...	...
129-Mile ...	...	...	...	...
Condingnow ...	Nil	...	...	...
163-Mile ...	10	1	...	...
Palaga Rocks ...	Nil	...	...	...
126-Mile ...	3	1	...	...
90-Mile	Nil	...	...	...
Mt. Jackson ...	2	1	...	...
Murchison:				
Wale	...	...	...	...
Yallalonga ...	Nil	...	...	...
Billabalong ...	...	...	...	...
Twin Peaks ...	...	...	...	...
Murgoo	Nil	...	23	2
Mt. Wittenoom ...	Nil	...	...	...
Meka	...	...	...	...
Wooleane ...	Nil	...	...	...
Boolardy ...	Nil	...	...	...
Woogorong ...	20	1	...	...
Manfred ...	...	...	...	...
Yarra Yarra ...	...	...	...	...
Milly Milly ...	...	...	...	...
Berringarra ...	Nil	...	...	...
Mileura	Nil	...	...	...
Mt. Gould ...	Nil	...	...	...
Moorarie ...	...	...	...	...
Wandary ...	...	...	...	...
Peak Hill ...	Nil	...	2	1
Mt. Fraser ...	...	...	...	...
Abbotts	Nil	...	10	1
Belele	...	...	...	...

RAINFALL—*continued.*

Stations.	April.		May.	
	No. of points. 100 = 1in.	No. of wet days.	No. of points. 100 = 1in.	No. of wet days.
Murchison—*contd.*				
Meekatharra	...	...	...	...
Star of the East	Nil	...	15	1
Nannine	Nil	...	10	1
Annean	Nil	...	...	...
Tuckanarra	...	...	...	...
Coodardy	Nil	...	...	...
Cue	Nil	...	20	2
Day Dawn	Nil	...	3	1
Lake Austin	Nil	...	38	2
Lennonville	Nil	...	25	3
Mt. Magnet	Nil	...	17	1
Youeragabbie	...	...	41	2
Murrum	Nil	...	...	...
Challa	Nil	...	...	...
Nunngarra	Nil	...	...	...
East Murchison:				
Gum Creek	...	...	...	...
Dural	...	...	...	...
Wiluna	Nil	...	5	1
Mt. Sir Samuel	Nil	...	2	1
Leinster G.M.	Nil	...	...	...
Lawlers	Nil	...	10	3
Lake Darlôt	Nil	...	1	1
Darda	...	...	...	...
Salt Soak	Nil	...	...	...
Duketon	Nil	...	...	...
North Coolgardie Goldfields:				
Burtville	...	...	...	...
Laverton	Nil	...	Nil	...
Mt. Morgans	Nil	...	1	1
Murrin Murrin	Nil	...	18	2
Mt. Malcolm	Nil	...	36	2
Mt. Leonora	Nil	...	17	3
Tampa	Nil	...	...	...
Kookynie	Nil	...	32	3
Niagara	Nil	...	37	4
Yerilla	...	...	...	...
Yundamindera	Nil	...	26	2
Mt. Celia	29	2	...	...
Edjudina	...	...	...	...
Quandinnie	...	...	...	...
Menzies	Nil	...	51	3
Mulline	5	2	70	3
Mulwarrie	Nil	...	127	5
Goongarrie	Nil	...	73	3
Coolgardie Goldfields:				
Waverley	2	1	...	...
Bardoc	Nil	...	105	3
Broad Arrow	Nil	...	140	4
Kanowna	Nil	...	145	5
Kurnalpi	Nil	...	96	3
Bulong	5	1	135	3
Kalgoorlie	Nil	...	130	4
Coolgardie	Nil	...	149	4
Burbanks	Nil	...	140	3
Bulla Bulling	Nil	...	155	6
Woolubar	Nil	...	188	4
Waterdale	Nil	...	210	4
Widgiemooltha	5	1	192	5
50-Mile	Nil	...	159	3
Norseman	Nil	...	130	...
Lake View	4	1	143	7
Frazer Range	Nil	...	...	...
Southern Hills	8	1	...	...
Yilgarn Goldfield:				
129-Mile	13	1	...	...
Emu Rocks	2	1	...	...
56-Mile	30	2	300	3
Glenelg Rocks	8	1	...	...
Burracoppin	8	1	161	4
Bodallin	Nil	...	109	3
Parker's Road	Nil	...	214	3
Southern Cross	5	1	225	7
Parker's Range	5	1	...	...
Yellowdine	Nil	...	199	5
Karalee	Nil	...	180	4
Koorarawalyee	Nil	...	210	3
Boorabbin	Nil	...	289	5
Boondi	3	1	315	6
South-West (Northern Division):				
Murchison House	15	2	...	...
Mt. View	1	1	...	...
Mumby	14	2	313	7
Northampton	Nil	...	320	8
Chapman Experimental Farm	13	1	262	4
Narra Tarra	22	...	259	4

RAINFALL—*continued.*

Stations.	April. No. of points. 100 = 1in.	April. No. of wet days.	May. No. of points. 100 = 1in.	May. No. of wet days.	Stations.	April. No. of points. 100 = 1in.	April. No. of wet days.	May. No. of points. 100 = 1in.	May. No. of wet days.
South-West (Northern Division)—*contd.*					South-West (Metropolitan)—*cont.*				
					Rottnest	21	3	...	...
Oakabella ...	...	...	...	...	Rockingham ...	38	2	505	14
White Peak ...	22	1	...	...	Jandakot ...	83	3	630	12
Geraldton ...	24	1	247	7	Armadale ...	56	4	843	13
Hinton Farm ...	11	1	236	6	Mundijong ...	50	4	551	14
Tibradden ...	23	2	295	6	Jarrahdale ...	105	5	590	15
Myaree	13	2	...	...	Jarrahdale (Norie)	86	4	513	15
Sand Springs ...	16	1	282	5	Serpentine ...	52	5	436	15
Nangetty ...	2	1	...	...					
Greenough ...	Nil	...	272	8					
Bokara	11	2	288	5					
Dongara ...	12	1	213	8					
Strawberry ...	...	...	...	...	Extreme South-West:				
Yaragadee ...	...	...	...	...					
Urella	11	1	...	...	Mandurah ...	43	3	719	13
Opawa	10	1	172	4	Pinjarra (Blythewood)	53	5	490	16
Mingenew ...	20	1	182	6					
Yandenooka ...	Nil	...	193	4	Pinjarra	89	3	574	14
Carnamah ...	14	1	204	7	Upper Murray ...	157	7	600	18
Watheroo ...	29	2	165	7	Yarloop	88	5	485	15
Nergaminon ...	...	...	...	...	Harvey	125	5	626	17
Dandaragan ...	51	3	228	10	Brunswick ...	107	5	401	9
Yatheroo ...	50	3	...	...	Collie	112	4	353	15
Moora	2	1	136	8	Glen Mervyn ...	132	4	264	14
Walebing ...	29	3	240	11	Donnybrook ...	134	4	328	12
Round Hill ...	27	1	179	9	Boyanup ...	107	5	326	10
New Norcia ...	28	4	199	12	Bunbury ...	57	4	371	12
Wongon Hills ...	12	1	...	...	Busselton ...	53	6	571	15
Wannamel ...	35	2	353	13	Quindalup ...	80	6	682	11
Gingin	25	3	510	12	Cape Naturaliste	73	6	625	15
					Glen Lossie ...	59	4	614	15
					Karridale ...	128	7	544	19
					Cape Leeuwin ...	109	11	543	22
					Lower Blackwood	114	5	...	...
South-West (Metropolitan):					Ferndale ...	...	...	...	...
					Greenbushes ...	278	5	...	...
Wanneroo ...	41	2	642	14	The Peninsula ...	121	10	...	...
Belvoir	54	3	622	16	Bridgetown ...	29	4	463	17
Wandu	51	5	532	19	Hilton	62	4	413	9
Mundaring ...	99	3	594	11	Greenfields ...	88	4	242	11
Canning Waterworks	91	4	...	...	Cundinup ...	50	2	240	11
					Wilgarrup ...	103	8	597	17
Kalbyamba ...	40	3	647	14	Balbarrup ...	186	5	...	...
Guildford ...	42	3	586	14	Bidellia ...	...	...	...	...
Perth Gardens ...	44	4	711	17	The Warren ...	...	...	...	...
Perth Observatory	54	3	675	18	Westbourne ...	73	5	...	...
Highgate Hill ...	57	3	668	15	Deeside	176	7	...	...
Subiaco	54	3	771	15	Riverside ...	142	7	...	...
Claremont ...	40	1	725	13	Mordalup ...	55	5	...	...
Fremantle ...	19	5	466	15	Lake Muir ...	77	3	...	...

RAINFALL—*continued.*

Stations.	April. No. of points. 100 = 1in.	April. No. of wet days.	May. No. of points. 100 = 1in.	May. No. of wet days.
Eastern Agricultural Districts:				
Emungin ...	11	3	270	15
Dowerin ...	9	1	...	...
Warramuggin ...	...	...	...	...
Monglin	...	...	...	...
Hatherley ...	...	...	...	...
Momberkine ...	20	1	...	...
Eumalga ...	13	1	...	...
Newcastle ...	38	2	396	14
Craiglands ...	26	2	251	10
Eadine	51	3	698	14
Northam ...	30	2	251	13
Grass Valley ...	14	2	226	13
Cobham	18	2	...	...
York	24	3	248	12
Yenelin	19	2	180	12
Currayocking ...	16	2	150	12
Cunderdin ...	21	2	111	11
Doongin	5	1	...	...
Whitehaven ...	15	1	109	9
Mt. Caroline ...	20	1	...	...
Cutenning ...	8	1	111	6
Kellerberrin ...	8	1	92	8
Cardonia ...	9	1	106	11
Baandee ...	18	2	...	...
Nangeenan ...	12	1	85	5
Merredin ...	5	1	113	5
Codg-Codgen ...	6	1	165	5
Noongarin ...	15	1	...	...
Mangowine ...	7	1	163	5
Yarragin ...	6	1	...	...
Wattoning ...	...	...	...	...
Great Southern Railway Line:				
Dalebridge ...	13	2	239	11
Beverley ...	11	1	243	11
Brookton ...	15	1	328	10
Sunning Hill ...	30	3	228	12
Pingelly ...	30	1	180	7
Yornaning ...	26	3	197	11
Narrogin ...	36	4	176	11
Narrogin Experimental Farm	29	2	...	...
Wagin	21	3	156	...
Katanning ...	33	4	205	10
Sunnyside ...	39	5	217	13
Broomehill ...	39	5	191	10

Stations.	April. No. of points. 100 = 1in.	April. No. of wet days.	May. No. of points. 100 = 1in.	May. No of wet days.
Great Southern Railway Line—*contd.*				
Woodyarrup ...	44	4	199	10
Pallinup ...	24	3	176	9
Tambellup ...	42	4	225	12
Toolbrunup ...	38	2	226	9
Cranbrook ...	...	...	...	...
Stirling View ...	73	4	337	15
Kendenup ...	58	8	...	...
Woogenellup ...	60	8	...	...
Wattle Hill ...	126	12	346	19
St. Werburgh's...	98	12	325	15
Mt. Barker ...	70	8	325	18
West of Great Southern Railway Line:				
Talbot House ...	25	2	252	11
Jelcobine ...	25	2	301	13
Bannister ...	56	2	...	...
Wandering ...	44	2	278	8
Glen Ern ...	41	3	...	...
Marradong ...	62	2	344	11
Wonnaminta ...	...	...	...	...
Williams ...	36	2	131	8
Rifle Downs ...	62	5	...	...
Darkan	29	2	...	...
Arthur River ...	25	4	239	5
Gainsborough ...	...	...	132	5
Glenorchy ...	52	3	249	7
Kojonup ...	62	4	287	10
Blackwattle ...	80	2	...	...
Warriup ...	87	7	343	12
Forest Hill ...	135	8	442	16
East of Great Southern Railway Line:				
Sunset Hills ...	17	2	...	...
Oakdale	17	2	213	12
Barrington ...	6	2	...	...
Bally Bally ...	20	2	...	...
Stock Hill ...	11	1	258	8
Qualin	17	1	202	12
Woodgreen ...	16	3	...	...
Gillimanning ...	24	2	...	...

RAINFALL—*continued.*

Stations.	April. No. of Points. 100 = 1in.	April. No. of wet days.	May. No. of points. 100 = 1in.	May. No. of wet days.
East of Great Southern Railway Line—*cont.*				
Wickepin ...	...	...	...	...
Crooked Pool ...	29	3	...	...
Bunking ...	26	2	...	...
Bullock Hills ...	6	1	...	...
Dyliabing ...	27	4	...	...
Glencove ...	27	4	...	...
Cherillalup ...	34	4	...	...
Mianelup ...	25	5	195	12
Woolganup ...	17	2	213	10
Chillinup ...	Nil	...	...	...
Jarramongup ...	...	...	...	...
South Coast:				
Wilson's Inlet ...	208	11	667	20
Grasmere ...	180	9	659	21
King River ...	147	4	...	...
Albany	175	12	579	22
Point King ...	161	6	452	18
Breaksea ...	134	16	372	22
Cape Riche ...	18	2	...	...
South Coast—*cont.*				
Peppermint Grove	47	7	505	14
Bremer Bay ...	33	6	298	12
Coconarup ...	1	1	113	9
Ravensthorpe ...	9	2	150	10
Cowjanup ...	13	4	...	...
Hopetoun ...	7	2	306	7
Fanny's Cove ...	29	3	...	...
Park Farm ...	18	2	...	...
Grass Patch ...	Nil	...	...	...
Swan Lagoon ...	11	2	...	...
30-Mile	12	2	...	...
Gibson's Soak ...	10	2	...	...
Myrup	20	3	...	...
Esperance ...	18	3	427	13
Boyatup	19	5	...	...
Lynburn ...	...	...	...	...
Middle Island ...	9	3	50	6
Point Malcolm ...	8	1	101	3
Israelite Bay ...	7	2	68	11
Balbinia	Nil	...	...	...
Balladonia ...	1	1	144	5
Eyre	18	4	134	7
Mundrabella ...	Nil	...	...	...
Eucla	Nil	...	151	6

The Observatory, Perth,
6th June, 1906.

W. E. COOKE,
Government Astronomer.

By Authority: A. Curtis, Acting Government Printer, Perth.